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SCE Training Curriculum for for Integrated Automation Solutions Totally Integrated Automation (TIA)

Siemens Automation Cooperates with Education

TIA Portal Module 090-010

WinCC Advanced with Runtime and TP700 Comfort Panel

Cooperates with Education

Automation

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Suitable SCE Trainer Packages for these training curriculums

SIMATIC controllers

- **SIMATIC S7-300 with CPU 314C-2PN/DP**
  Order no.: 6ES7314-6EH04-4AB3
- **SIMATIC S7-300 with CPU 314C-2PN/DP (upgrade)**
  Order no.: 6ES7314-6EH04-4AB4
- **SIMATIC S7-300 with CPU 315F-2PN/DP**
  Order no.: ES7315-2FH14-4AB1
- **SIMATIC ET 200S with CPU IM151-8 F PN/DP**
  Order no.: 6ES7151-8FB00-4AB1

SIMATIC HMI

- **SIMATIC TP700 Comfort Panel - Color**
  Order no.: 6AV2133-4AF00-0AA0

SIMATIC STEP 7 Software for Training

- **SIMATIC STEP 7 Professional V11 - Single license**
  Order no.: 6ES7822-1CC01-4YA5
- **SIMATIC STEP 7 Professional V11 - Classroom license (up to 12 users)**
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- **SIMATIC STEP 7 Professional V11 - Upgrade license (up to 12 users)**
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We wish to thank the Michael Dziallas Engineering Corporation and all other involved persons for their support during the preparation of this document.

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SEITE:

1. Preface 5
2. Notes on programming for SIMATIC S7-300 7
2.1 SIMATIC S7-300 automation system 7
2.2 STEP 7 Professional V11 (TIA Portal V11) programming software 7
2.3 Operator control and monitoring with WinCC 8
3.0 Project description 9
3.1 Hardware configuration 9
3.2 Plant description 10
3.3 Task 11
3.4 Configuration 11
4. Inserting a TP700 Comfort Panel into the color mixing station project 12
4.1 Loading and re-saving a project template 13
5. WinCC user interface 25
5.1 Project tree 26
5.2 Menu bar and buttons 26
5.3 Working area 27
5.4 Tools 27
5.5 Properties window 28
5.6 Details view 28
5.7 Layout 29
6. Device configuration of the TP700 Comfort Panel 30
6.1 Setting the IP address 31
6.2 Setting the panel as PROFINET IO device 32
7. Configuring screens 33
7.1 Root screen 34
7.2 Tank 1 screen 44
7.3 Tank 2 screen 47
7.4 Tank 3 screen 47
7.5 Testing configuration in Runtime 48
8. Settings on the TP700 Comfort Touch Panel 50
8.1 Setting the date and time 51
8.2 Setting transfer properties 52
8.3 Assigning PROFINET device names 53
8.4 Reboot 53
8.5 Transfer mode 54
8.6 Configuring a connection 55
9. Display and operating objects 56
9.1 Layers 56
9.2 Basic objects 57
9.3 Enhanced objects 59
10. Display and operating objects in the "Color mixing station" project 60
10.1. Configuring display and operating objects in the “Tank 1” screen 60

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10.2 Configuring display and operating objects in the “Tank 2” and “Tank 3” screens 76
10.3 Objects in the root screen 78
10.4 Configuring objects in the permanent window 97
11. Configuring alarms 101
11.1 Analog alarms 101
11.2 Alarm window 103
11.3 Testing alarm configuration in Runtime 104
12. Configuring recipes 105
12.1 Adding recipes 105
12.2 Specifying data records 106
12.3 Creating "Recipe input" and "Select recipe" screens 106
12.4 Selecting a recipe in Runtime 111
12.5 Entering new recipes in Runtime 112
13. Configuring user administration 113
13.1 Setting up user groups 113
13.2 Creating users 114
13.3 Assigning authorizations 115
13.4 Testing user administration in Runtime 118

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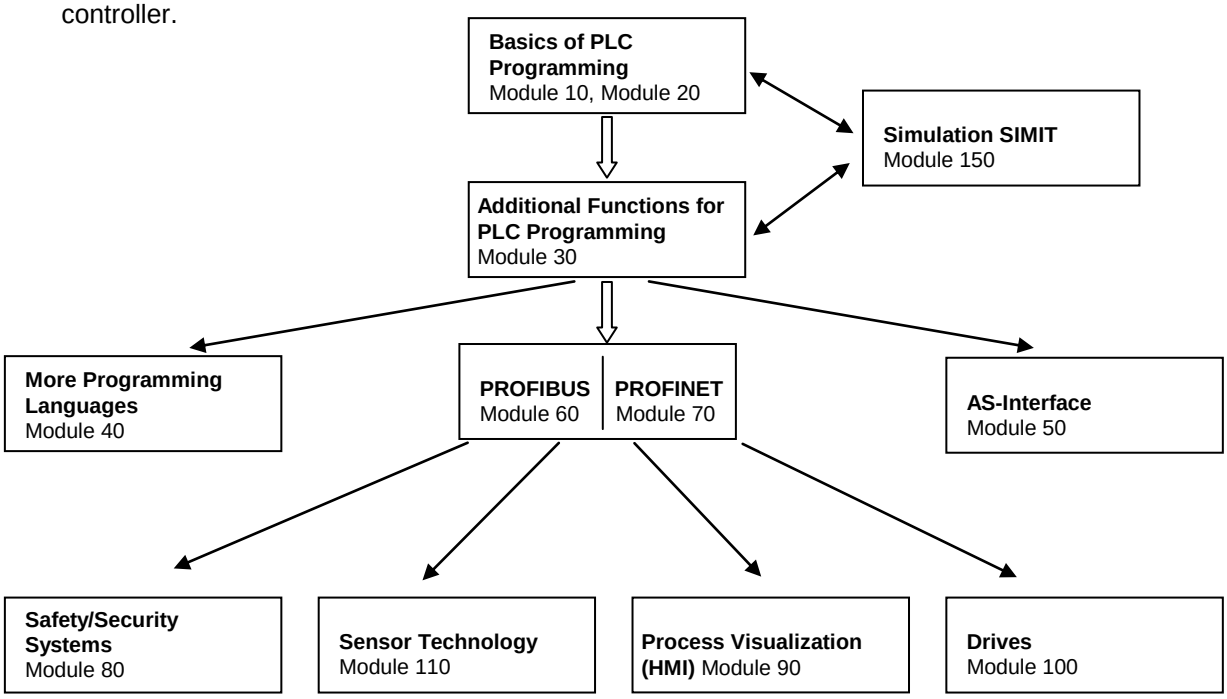
1. Preface

Regarding its content, module 010-090 is part of the training unit **'Process visualization'** and demonstrates how to configure WinCC visualization between the TP700 panel and the SIMATIC S7-300 controller.



Training objective:

This module describes the most important functions of the WinCC Advanced V11 software.

Typical tasks are performed in a sample plant.

- "Open" and "Save as" of a STEP 7 project
- Inserting an HMI station
- WinCC Advanced V11 interface
- Configuring display and operating objects
- Configuring alarms
- Creating recipe management
- Setting up user administration

Requirements:

To successfully work through this module, the following knowledge is assumed:

- Proficiency in working with Windows
- Basics of PLC programming with the TIA Portal
  (e.g. module 020-010 - 'Startup' Programming of SIMATIC S7-300 with TIA Portal V11)
- Blocks for SIMATIC S7-300
  (e.g. module 030-010 – Block Types for SIMATIC S7-300)
- Timer and counter blocks for SIMATIC S7-300
  (e.g. module 030-020 – IEC Timers and IEC Counters for SIMATIC S7-300)

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Hardware and software needed

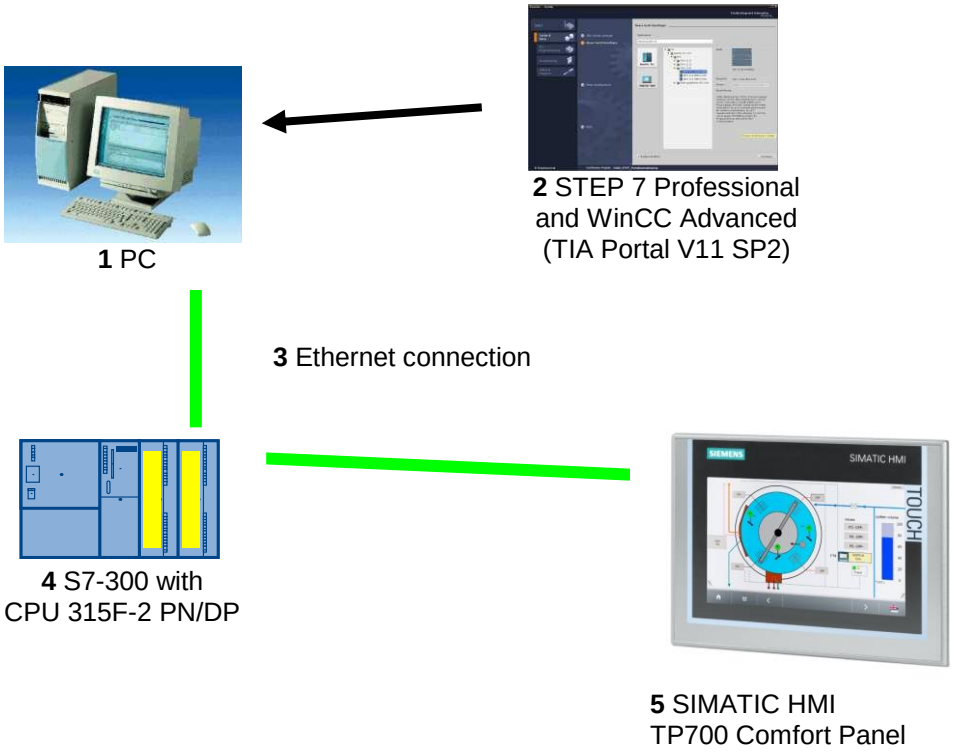
1 PC Pentium 4, 1.7 GHz 1 (XP) – 2 (Vista) GB RAM, free disk storage approx. 2 GB Operating system Windows XP Professional SP3/Windows 7 Professional/Windows 7 Enterprise/Windows 7 Ultimate/Windows 2003 Server R2/Windows Server 2008 Premium SP1, Business SP1, Ultimate SP1

2 Software STEP 7 Professional V11 SP2 (Totally Integrated Automation (TIA) Portal V11) and WinCC Advanced V11 SP2

3 Ethernet connection between PC and CPU 315F-2 PN/DP

4 SIMATIC S7-300 PLC, e.g. CPU 315F-2PN/DP with 16DI/16DO signal module. The inputs have to be brought out to a panel.

5 SIMATIC HMI TP700 Comfort Panel


1 PC
2 STEP 7 Professional and WinCC Advanced (TIA Portal V11 SP2)
3 Ethernet connection
4 S7-300 with CPU 315F-2 PN/DP
SIMATIC HMI
TOUCH
5 SIMATIC HMI TP700 Comfort Panel

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2. Notes on programming for SIMATIC S7-300

2.1 SIMATIC S7-300 automation system

The SIMATIC S7-300 automation system is a modular microcontroller system for the low and medium performance range.
A comprehensive range of modules is available to optimally adapt the system to the automation task.
The S7 controller consists of a power supply, a CPU, and input and output modules for digital and analog signals.
If necessary, communication processors and function modules are also used for special tasks such as stepper motor control.

The programmable logic controller (PLC) uses the S7 program to monitor and control a machine or a process. The I/O modules are queried via the input addresses (%I) and addressed via the output addresses (%Q) in the S7 program.

The system is programmed with the STEP 7 software.

2.2 STEP 7 Professional V11 (TIA Portal V11) programming software

STEP 7 Professional V11 (TIA Portal V11) software is the programming tool for the following automation systems

- SIMATIC S7-1200
- SIMATIC S7-300
- SIMATIC S7-400
- SIMATIC WinAC

STEP 7 Professional V11 provides the following functions for plant automation:

- Configuration and parameter assignment of the hardware
- Specification of the communication
- Programming
- Testing, commissioning, and servicing with operational/diagnostic functions
- Documentation
- Creation of visualizations for SIMATIC Basic Panels using the integrated WinCC Basic software.
- Visualization solutions for PCs and other panels can also be created with other WinCC software packages

Support is provided for all functions in a comprehensive online help system.

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2.3 Operator control and monitoring with WinCC

System description

Since processes are becoming more and more multi-layered and the demands regarding the functionality of machines and plants are rising, the operator needs a powerful tool to control and monitor production systems. An HMI (Human Machine Interface) system represents the interface between the human being (operator) and the process (machine/system). The controller has the actual control over the process. There is an interface between the operator and WinCC (at the HMI panel) and an interface between WinCC and the controller.
WinCC is the software that you use to handle all necessary configuration tasks. WinCC Advanced V11 is the software for process visualization.

WinCC handles the following tasks:

• Representing the process

The process is represented on the HMI device. If, for example, a state changes in the process, the display is updated on the HMI device.

• Operating the process

The operator can operate the process via the graphical user interface. The operator can, for example, enter a setpoint for the controller or start a motor.

• Generating alarms

If critical process states occur in the process, an alarm is triggered automatically; for example, if a specified limit is exceeded.

• Logging process values and alarms

The HMI system is able to log alarms and process values. Thus, the process can be documented and you can still access older production data at a later time.

• Documenting process values and alarms

Alarms and process values can be read out by the HMI system as a log. For example, you can output the production data at the end of a shift.

• Managing process parameters and machine parameters

The HMI system is able to store parameters for processes and machines in recipes. You can transfer these parameters from the HMI panel to the controller, for example, in a single step in order to change production to another product type.

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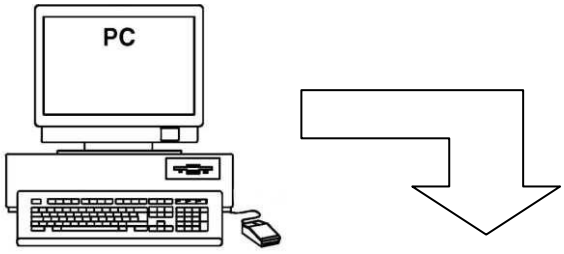
3.0 Project description

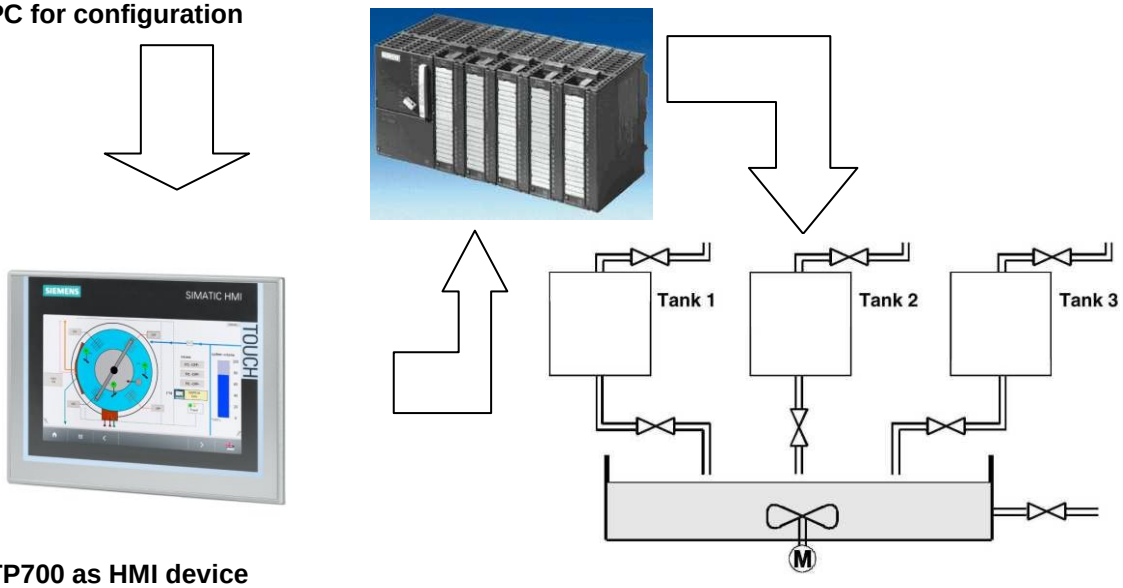
3.1 Hardware configuration

In our sample program for a color mixing station, we use a programming device with WinCC Advanced V11 and WinCC Advanced V11 simulation.
The color mixing station is controlled using a SIMATIC S7-300. The operator uses a Touch Panel (TP700) to operate the process via the graphical user interface.
The operator can, for example, enter a setpoint for the controller or start a motor.

The programming device, the SIMATIC S7-300 controller and the TP700 operator panel are interconnected via the Ethernet interface.
The color mixing station is connected to the controller via digital and analog inputs and outputs.



PC for configuration



TP700 as HMI device

Note
WinCC Advanced Runtime simulation can also be used to represent the TP700 Touch Panel on the programming device.

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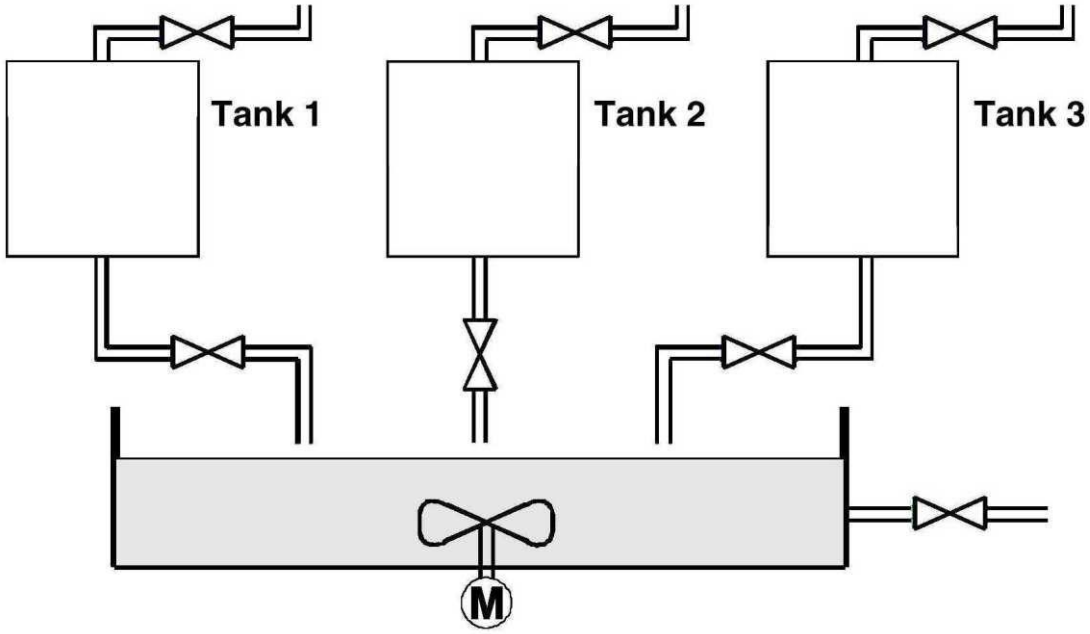
3.2 Plant description



A color mixing station is controlled using a SIMATIC S7-300 in automatic or in manual mode. In "Automatic" mode, the three tanks are filled using a two-point control mechanism.
At minimum fill level, the supply valve of the corresponding tank is opened automatically and only closed once the maximum fill level is reached.
The preset program is run when the Start button is pressed.
First, the drain valves are opened and the corresponding default quantities are filled into the reservoir from the separate tanks.
After the drain valves are closed, the mixer motor is started.
At the end of the mixing process and after a short rest period, the drain valve of the reservoir opens and the finished color mixture is discharged.
The start function is enabled as soon as the reservoir is empty.
The light in the start button is lit and a new color mixing process can be started.

In "Manual" mode, the automatic draining process is terminated; all valves and the mixer motor can then be operated manually.
The lights in the buttons for manual operation are lit.

Note

The default quantities and time periods are determined by the program.
If another color mixing process is to be started, the default quantities and time periods must be changed in the program or a new program must be loaded to the controller.

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3.3 Task

In the case of the color mixing station, the program was modified using the programming device every time the mixing ratio had to be changed. Since these modifications are not only time-consuming but also risky if input is incorrect, the decision was made to add a TP700 Comfort Touch Panel to the color mixing station.

Using the panel, the following requirements are to be met:

- It should now be possible to operate the color mixing station via the panel as well.
- The fill levels of the tanks and of the reservoir are to be indicated as bars and also as numerical values.
- The movement of the mixer motor is to be represented graphically.
- The default quantities are to be entered using the panel.
- The minimum and maximum fill levels of the three tanks are to be displayed on separate tank screens.
- Switching between the operating modes is also to be performed using the panel, and the respective operating mode will be displayed on the panel.
- The finished mixtures are to be stored as recipes in the panel and need only be selected by the operator.
- The fill levels are monitored and alarms are to be generated in the event of danger.
- A password must be entered in order to operate the color mixing station.
- Communication of the TP700 Comfort Panel with SIMATIC S7-300 controller is to take place via the Ethernet interface.

3.4 Configuration

The STEP 7 Professional V11 configuration software and WinCC Advanced V11 are used to create a process visualization for the color mixing station on the programming device. The process values are represented with screens and screen objects. Default values can be transferred to the controller using operator controls. Communication between the HMI panel and the machine or the process takes place by means of **tags** via the controller. The value of a tag is written to a memory area (address) in the controller, where it is read by the HMI panel.

The process visualization is saved and transferred from the programming device to the TP700 Comfort HMI panel after generation.
After the panel is powered up, the process can be monitored and the plant can be operated.

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4. Inserting a TP700 Comfort Panel into the color mixing station project

The '**Totally Integrated Automation Portal V11'** software is used for project management and programming.

Components such as control, visualization, and networking of the automation solution are created, assigned parameters, and programmed here using a standard interface.
Online tools are available for the error diagnostics.

In the following section, a project is to be opened for SIMATIC S7-300, the project is to be stored under a different name and adapted to the new requirements:

The central tool is the **'TIA Portal V11'**, which is opened with a double-click.

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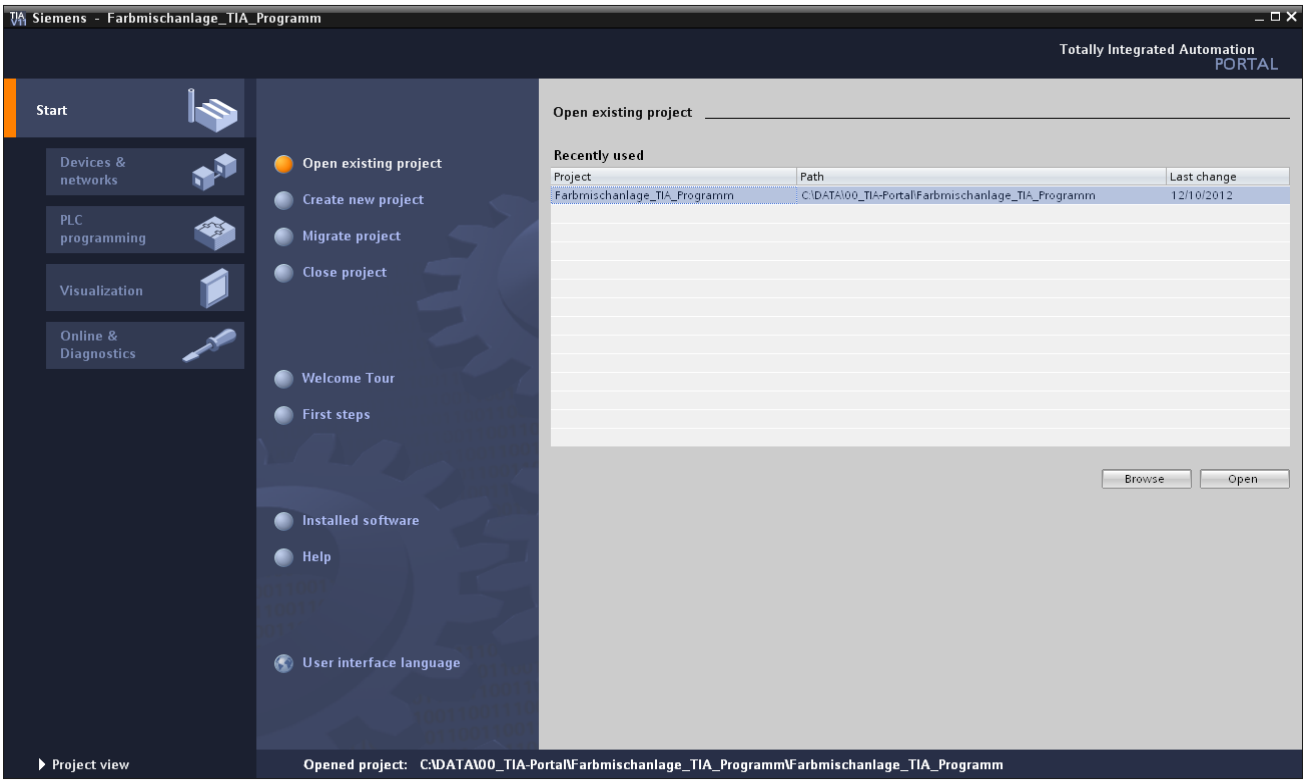
4.1 Loading and re-saving a project template

The project **"Color mixing station_TIA_Program"** from Module 090-010 will now be opened as a template for this program.



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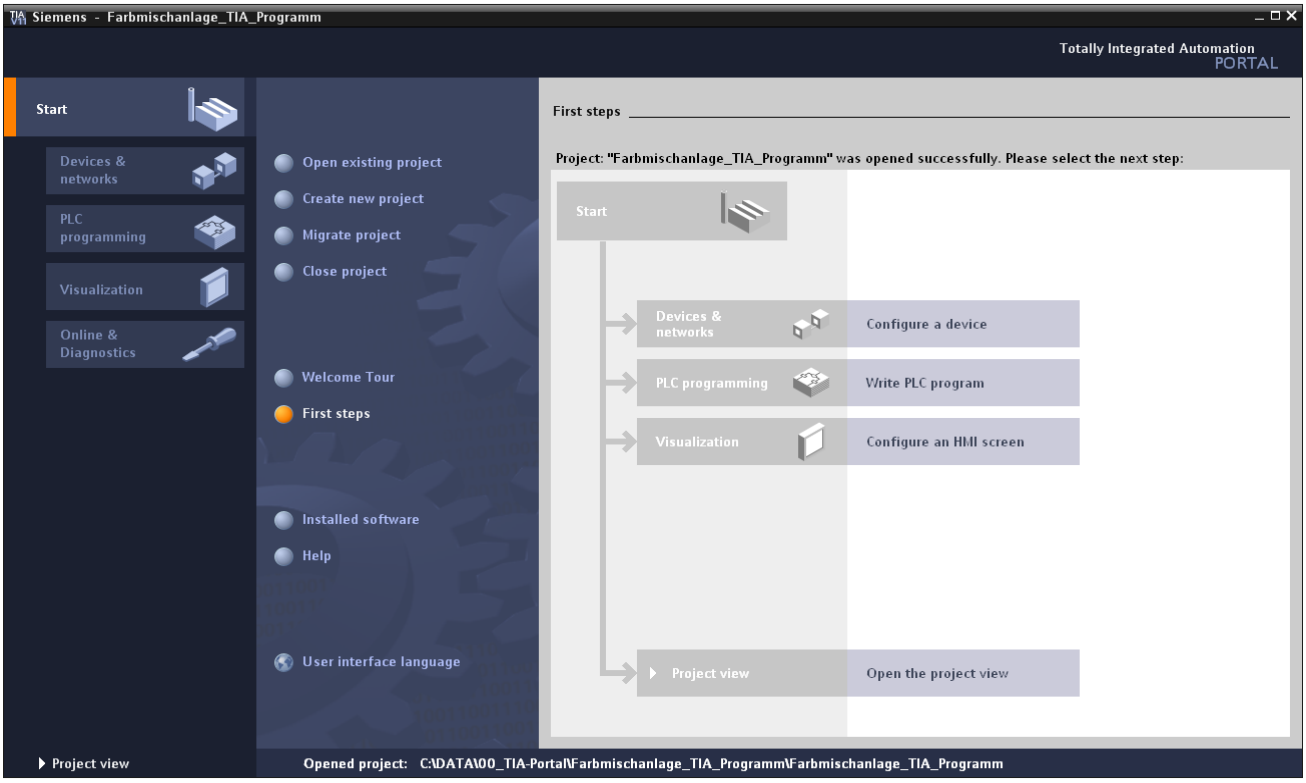
‘**First steps’** for configuring are now suggested.

Click **’Open the project view‘**.



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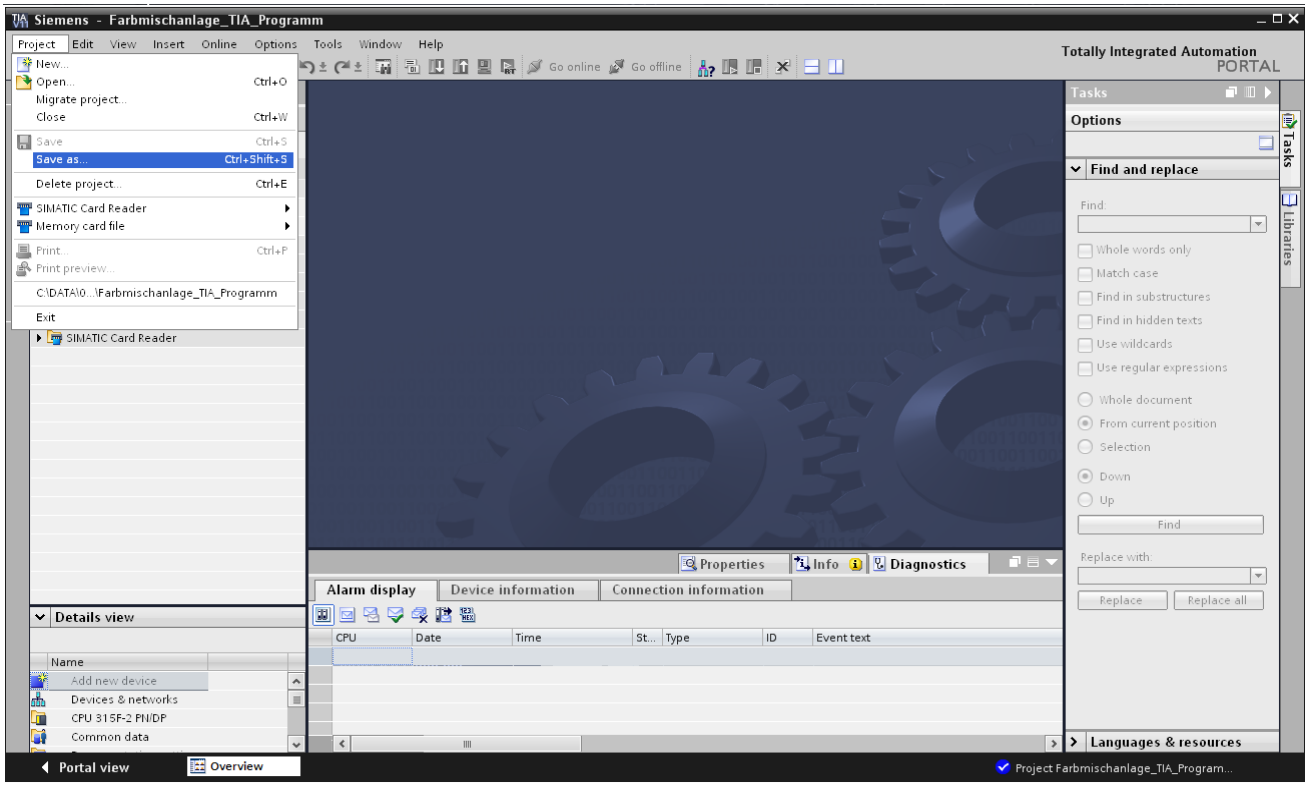
Start by saving the project under a different name.

In the **Project** menu, click "**Save as**".



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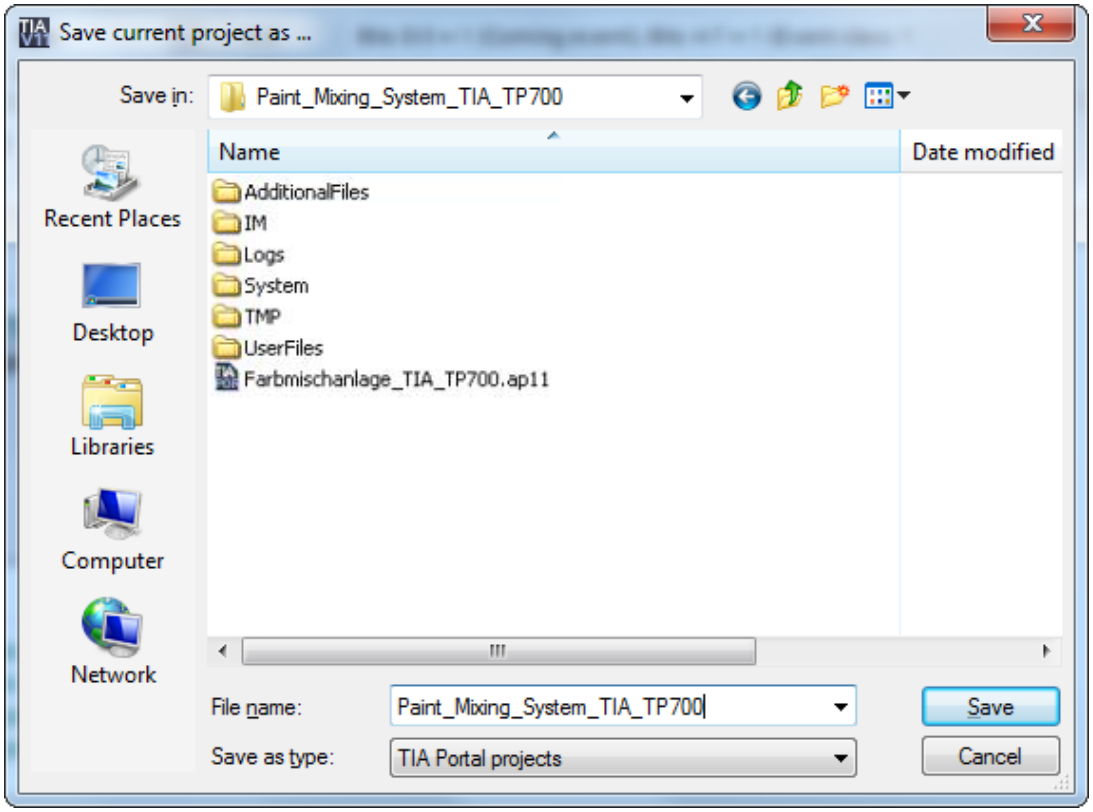
'Save' the project under the new name **'Color mixing station_TIA_TP700'**.



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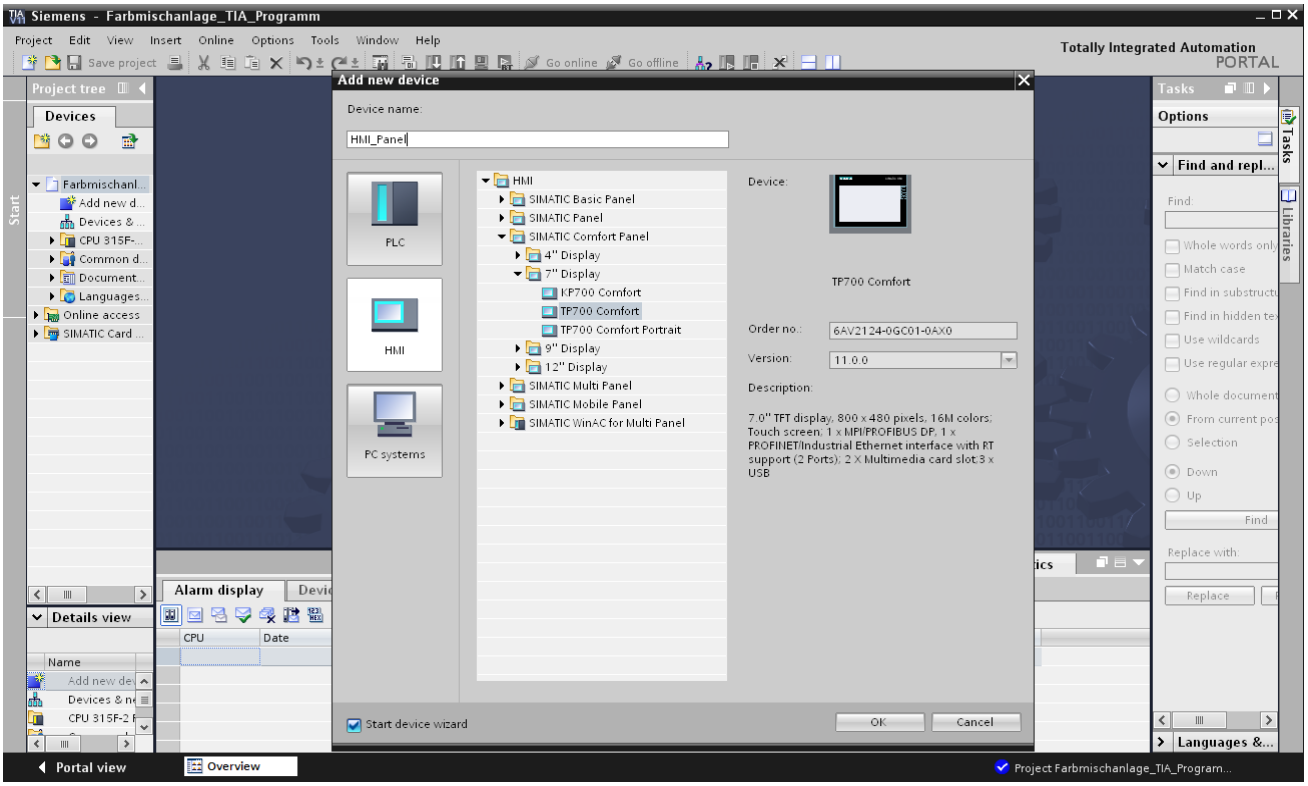
To set up a new panel in the project, double-click '**Add new device**' to open the selection window.

Under HMI, SIMATIC Comfort Panel, select the 7" Display Panel “**TP700 Comfort**”.

Enter the device name and set the check mark for "**Start device wizard**".

Click "**OK**".



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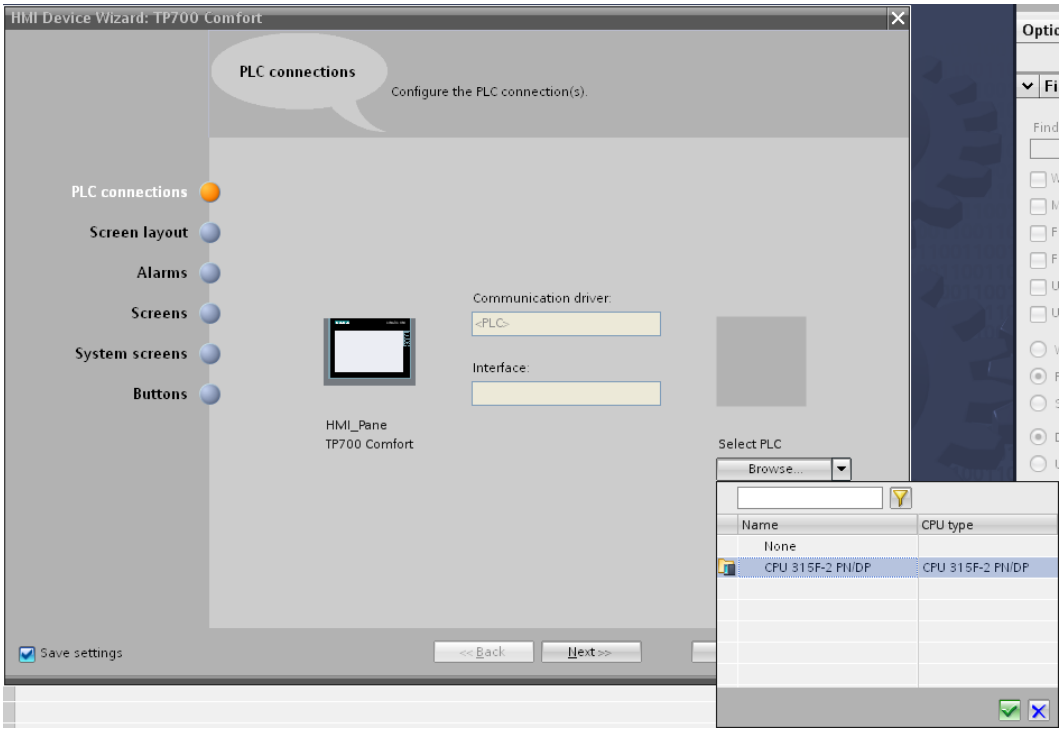
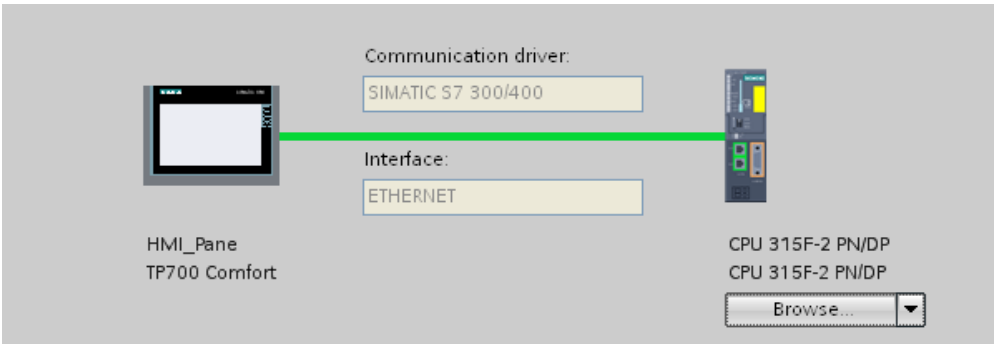
Under PLC, first select the "**CPU 315F-2 PN/DP**".





Then, click "**Next**".

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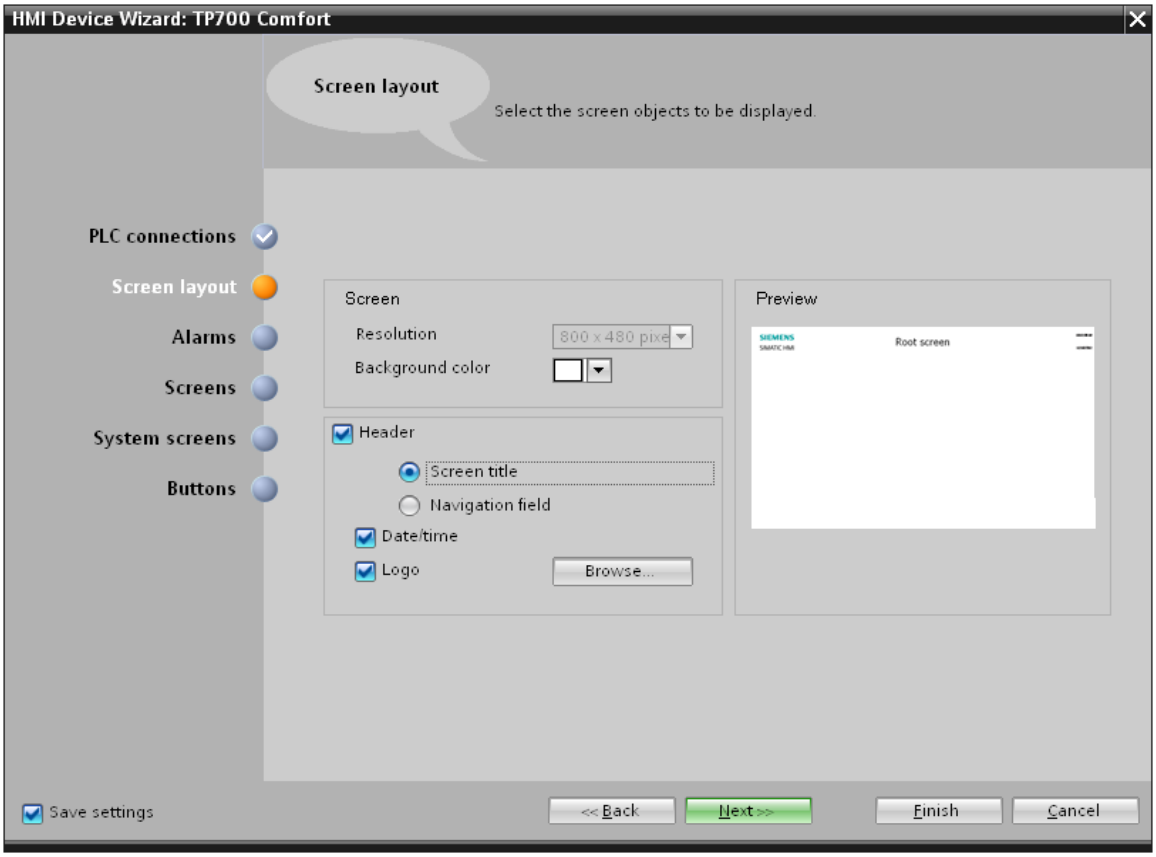
Under Screen layout, change the background color to "**White**" and make the settings for "**Header**".



Now, click "**Next**".

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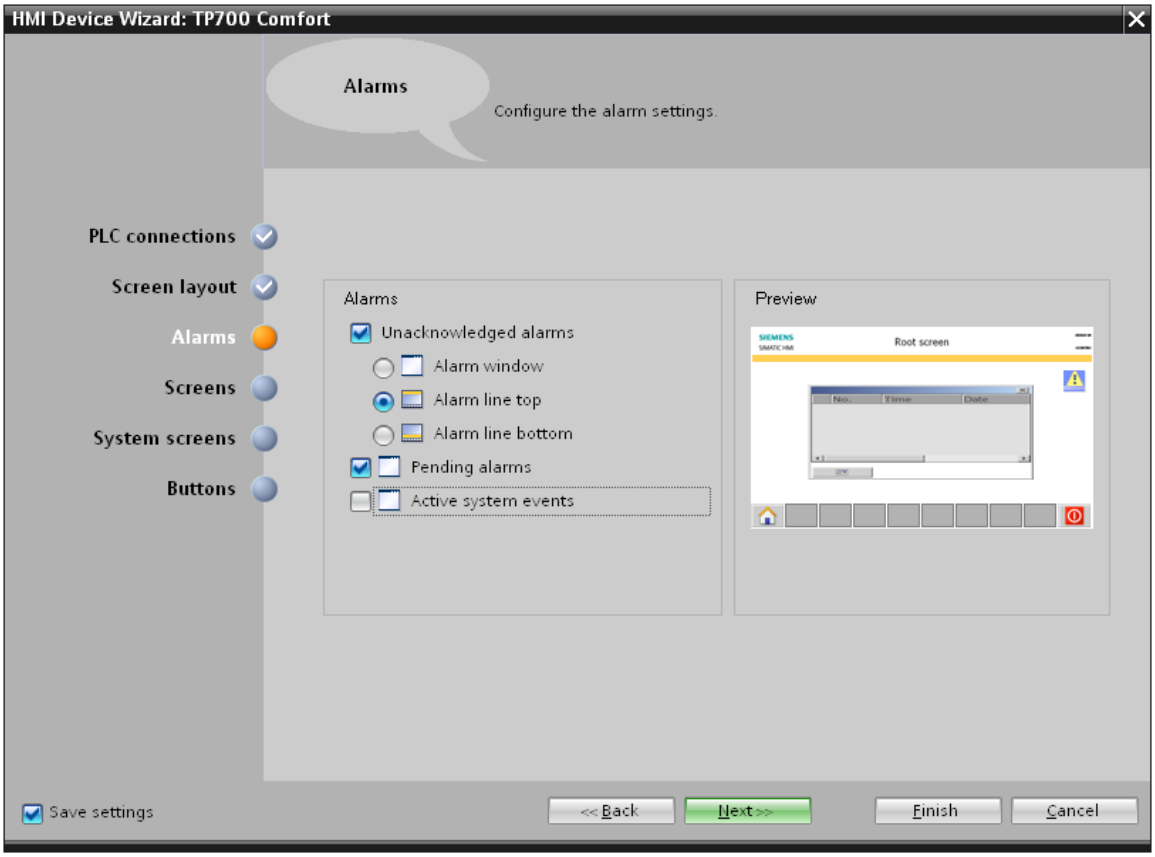
Set the check marks for Alarms.



Then, click "**Next**".

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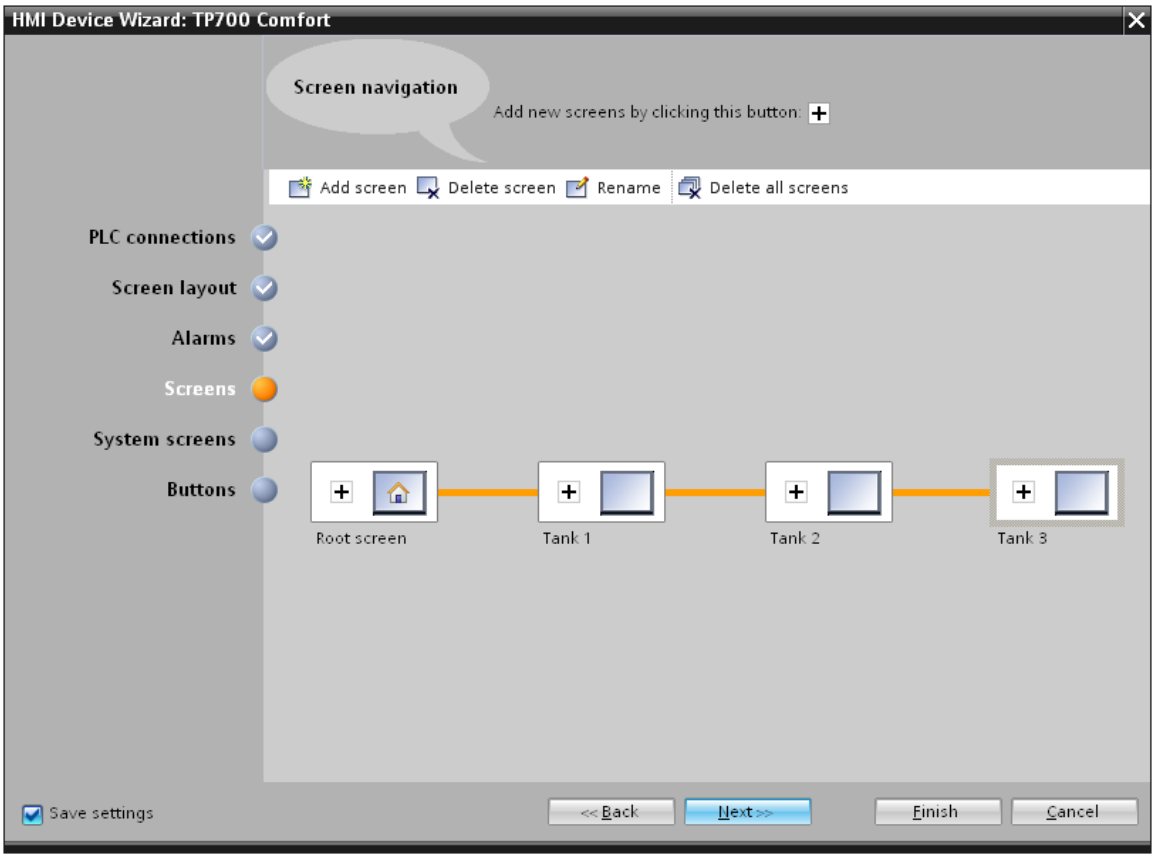
A screen menu structure can be set up under Screen navigation.

For our example, four screens will suffice to begin with.

Assign the names "**Root screen, Tank 1, Tank 2, Tank 3**".



After that, click "**Next**".

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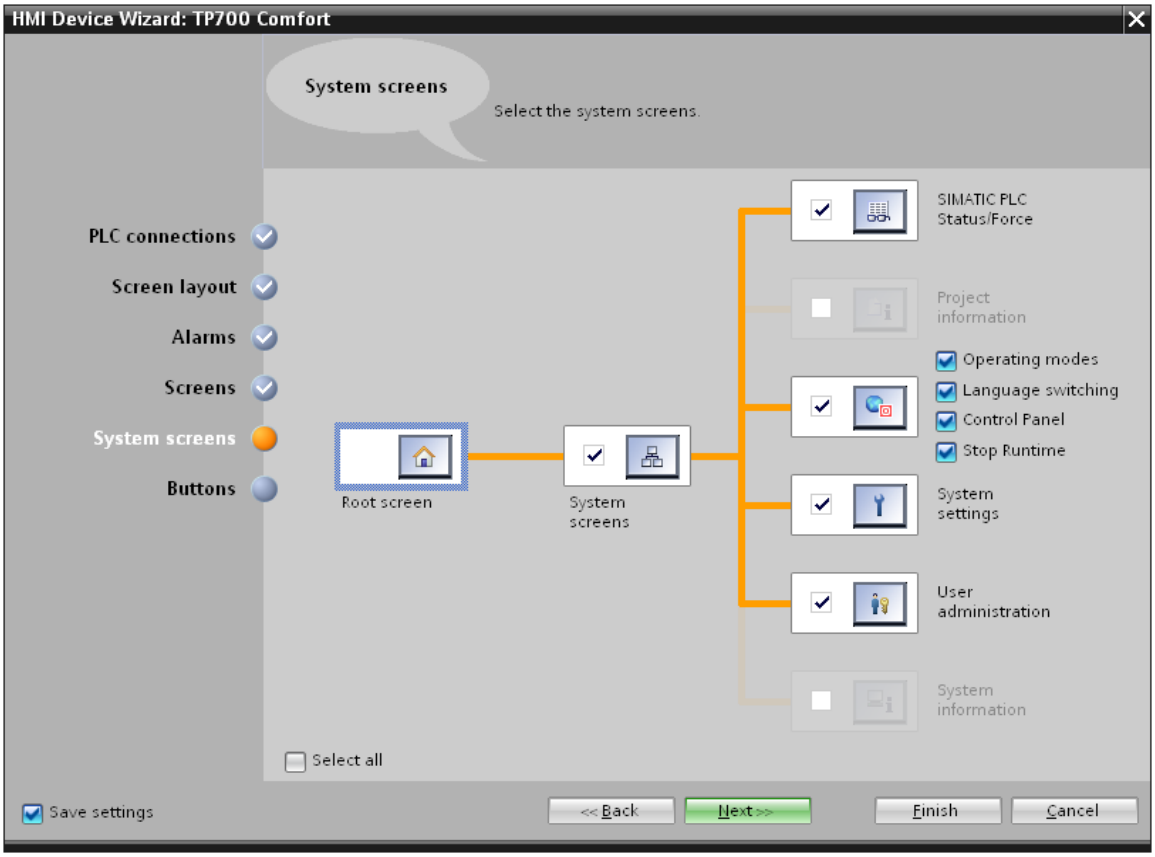
Select the system screens.



Then, click "**Next**".

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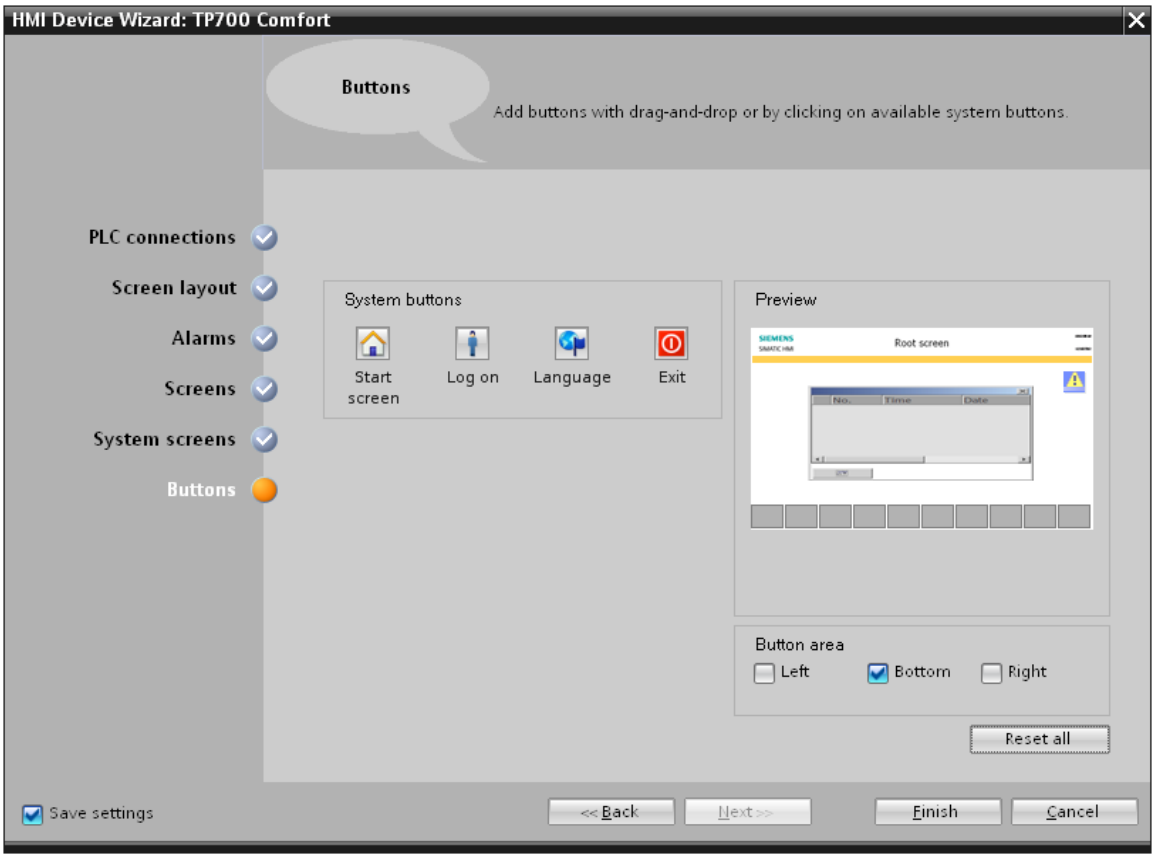
To conclude, predefined system buttons can also be positioned.

Remove all check marks.



Now, click "**Finish**".

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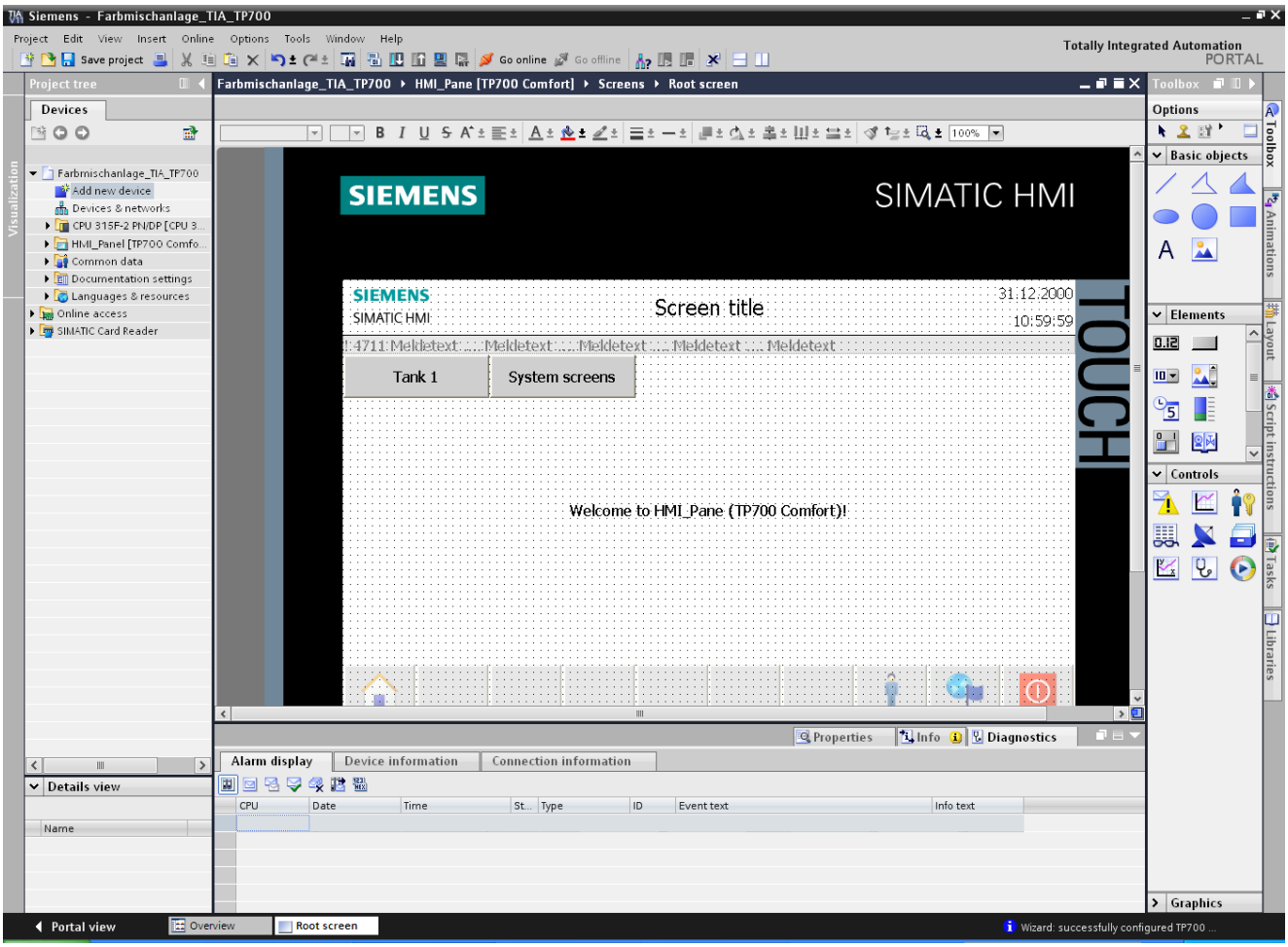
The WinCC interface now opens with the root screen.



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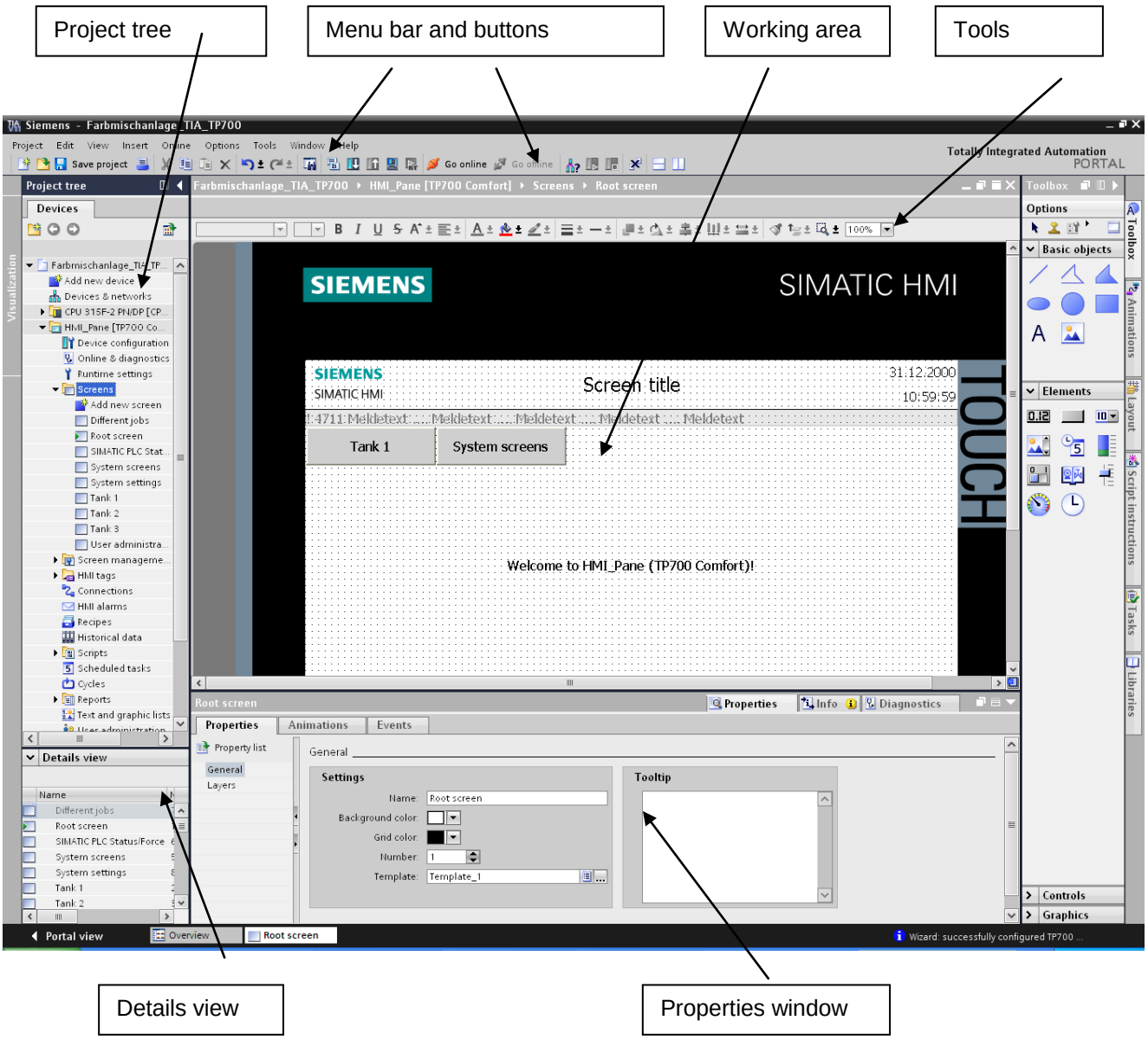
5. WinCC user interface



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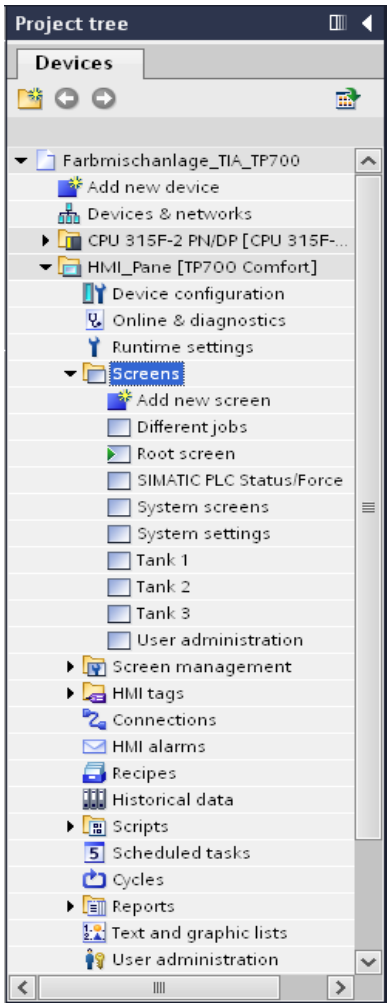
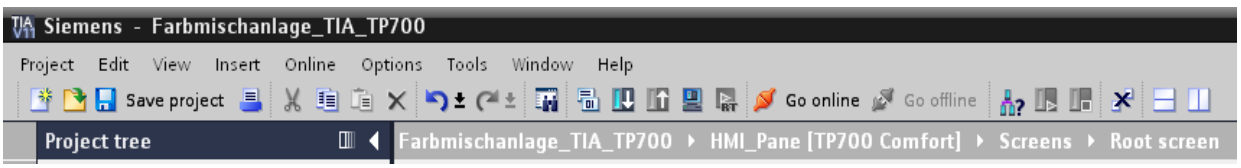
5.1 Project tree

The project tree window is the central control point for project editing.
All components and all available editors of a project are displayed in a tree structure in the project window and can be opened there.
Each editor is assigned a symbol that identifies the associated object. Only elements supported by the selected HMI device are displayed in the project window.
In the project window, you can access the HMI device settings.



5.2 Menu bar and buttons

The menus and the toolbars provide all the functions needed to configure the HMI device. If a corresponding editor is active, editor-specific menu commands and toolbars are displayed.
If you point to a command with the mouse, a corresponding tooltip is provided for each function.



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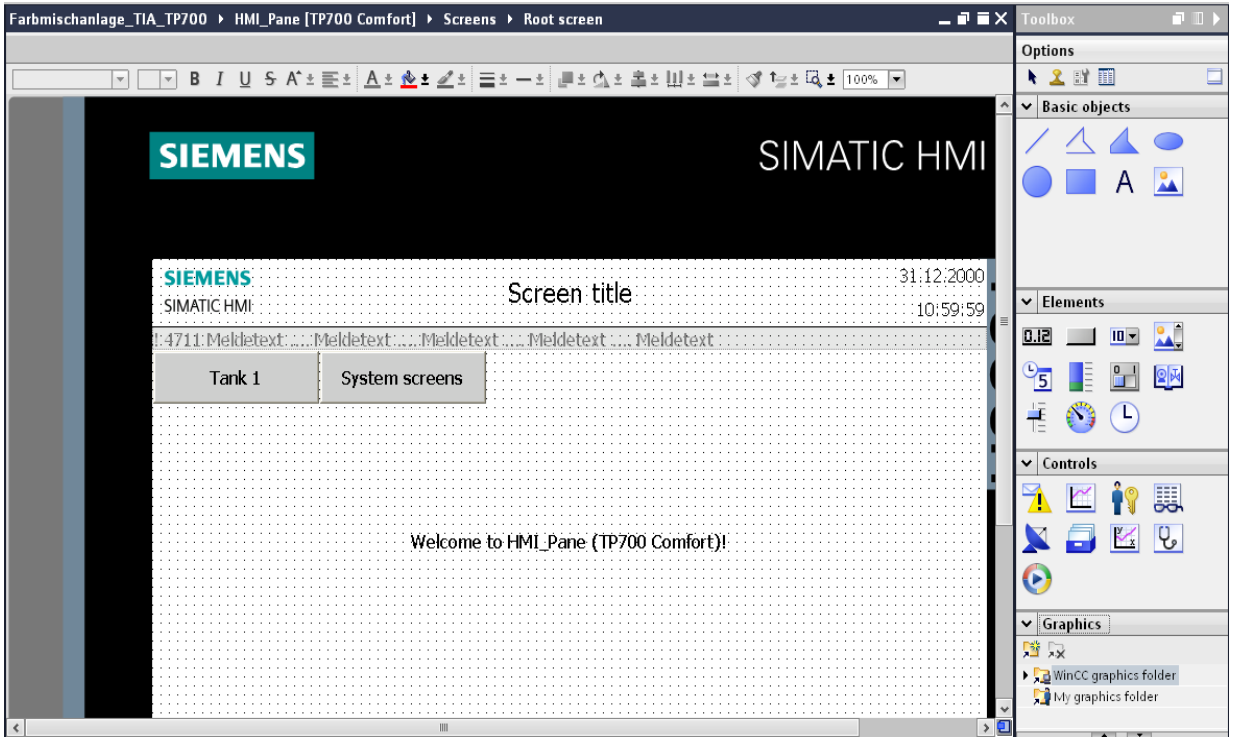
5.3 Working area

The objects of the project are edited in the working area. All WinCC elements are arranged around the working area.
In the working area, we edit the project data either in tabular form (for example, tags) or graphically (for example, a process screen).
A toolbar is located in the upper part of the working area.
Fonts, font colors and functions such as rotate, align, etc. can be selected here.



5.4 Tools

In the Tools window, a selection of objects is provided that can be inserted into screens, such as graphic objects and operator control. In addition, the Tools window includes graphics with preassembled graphic objects and collections of faceplates.
Objects are dragged to the working area.

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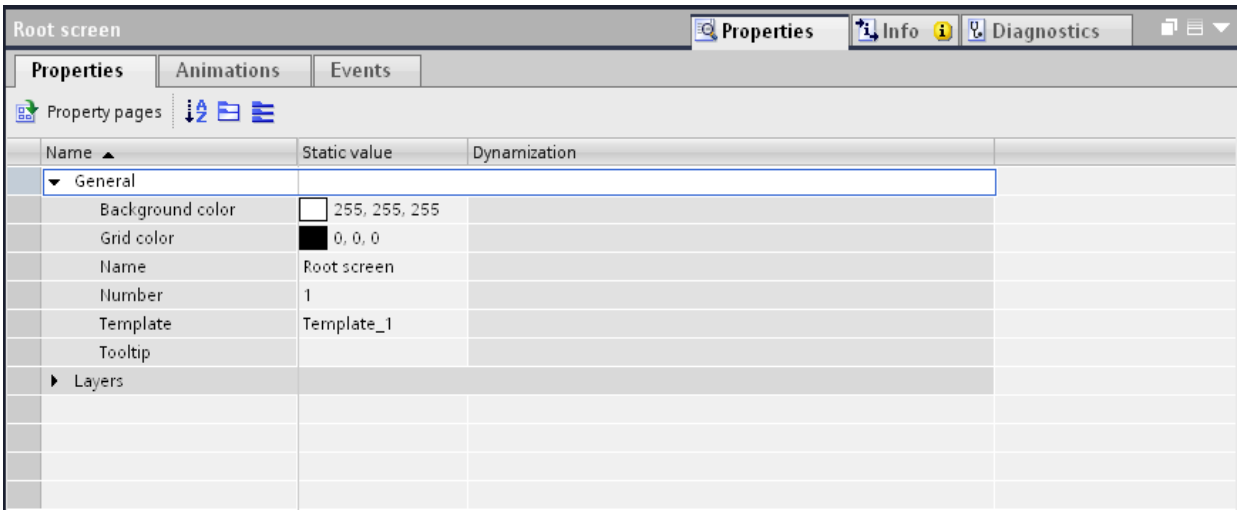
5.5 Properties window

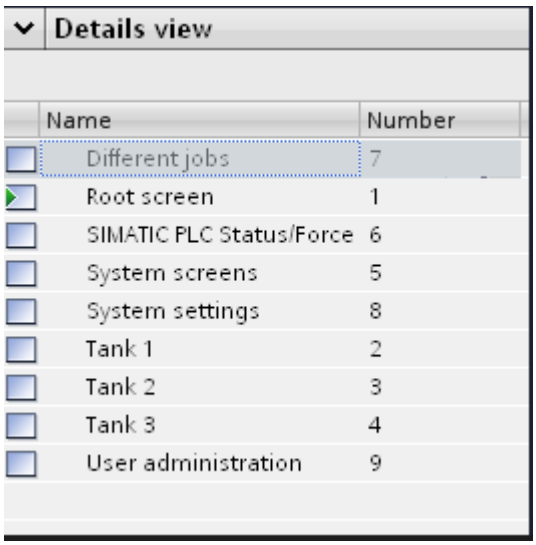
In the properties window, you edit the properties of objects; for example, the color of screen objects.
The properties window is available only in certain editors.
In the properties window, the properties of the selected object are displayed arranged according to categories. As soon as you exit an input field, the value changes become effective.
If you enter an invalid value, this field is highlighted in color.
To obtain information on the valid data range, for example, view the tooltip.

In addition, animations and events of the selected object are configured in the properties window; in this case, for example, a screen change when the button is released.



5.6 Details view

The details view displays additional information on the object selected in the project tree.



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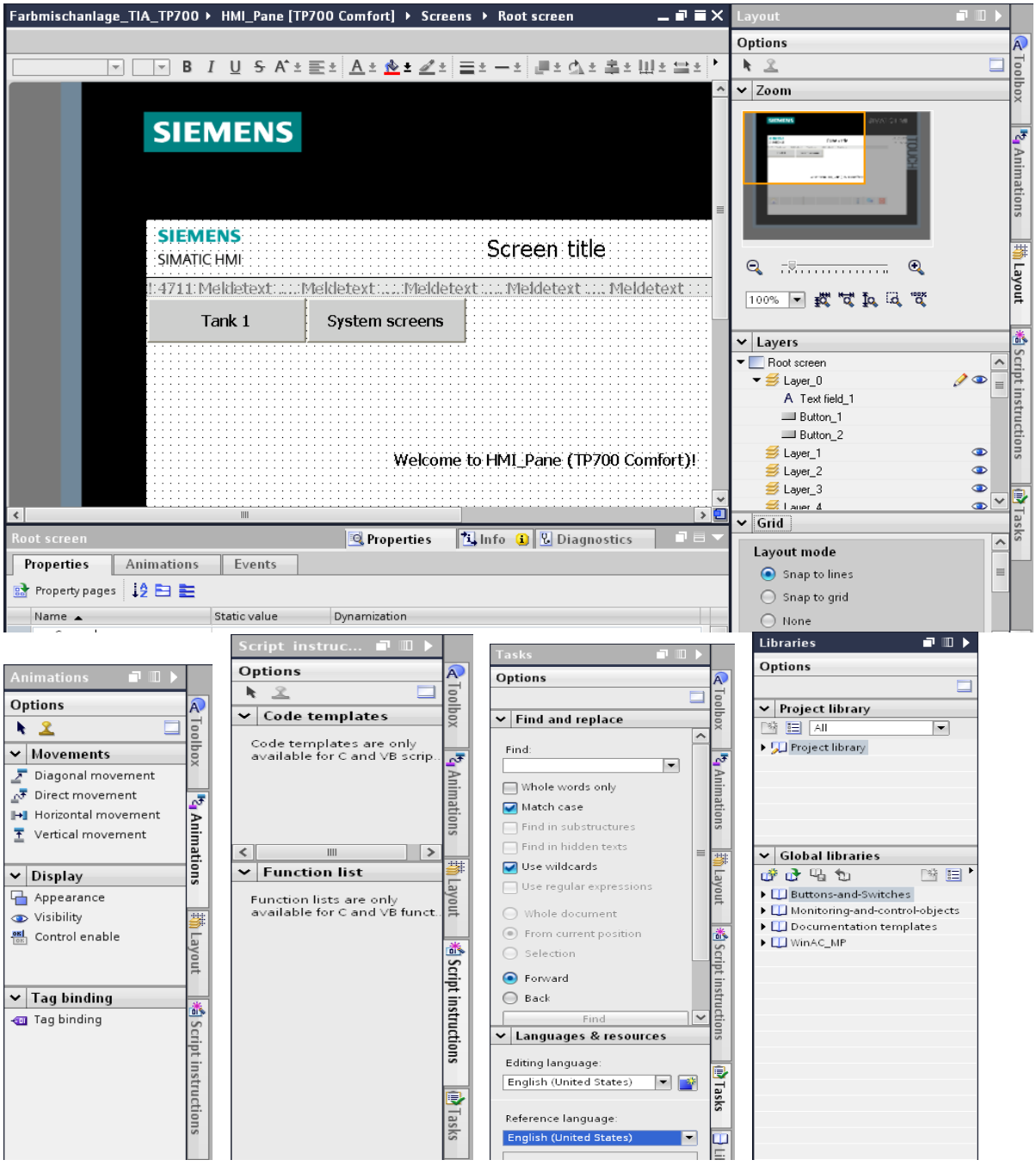
5.7 Layout

Settings for the working area such as the zoom view, level selection and grid functions can be made in the layout window. Animations, instructions, tasks and libraries of the relevant object can be selected using additional tabs.



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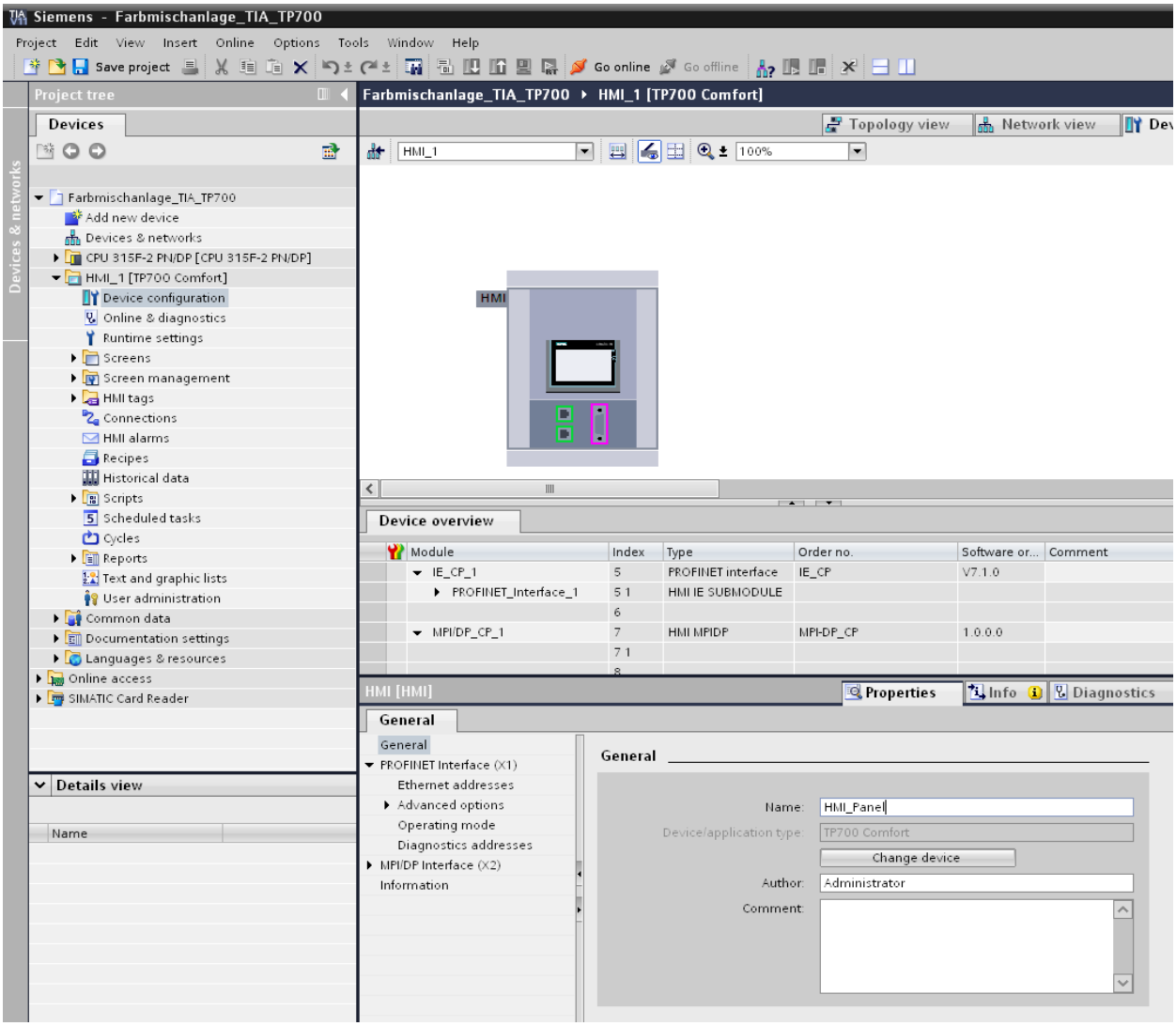
6. Device configuration of the TP700 Comfort Panel

To open, double-click the device configuration of the HMI_Panel [TP700 Comfort].



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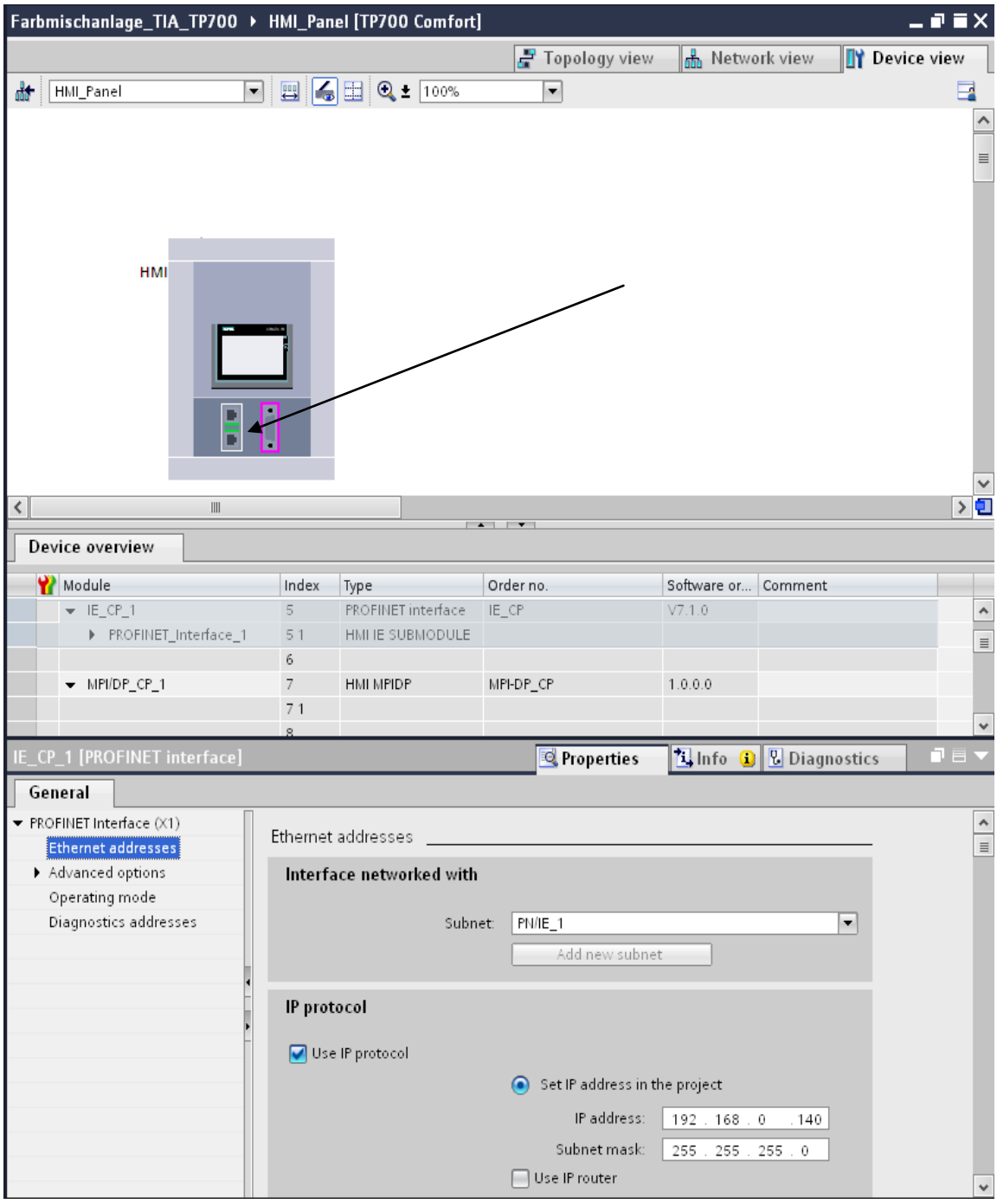
6.1 Setting the IP address

Select the Ethernet interface of the panel and set the IP address **192.168.0.140** under Ethernet addresses.



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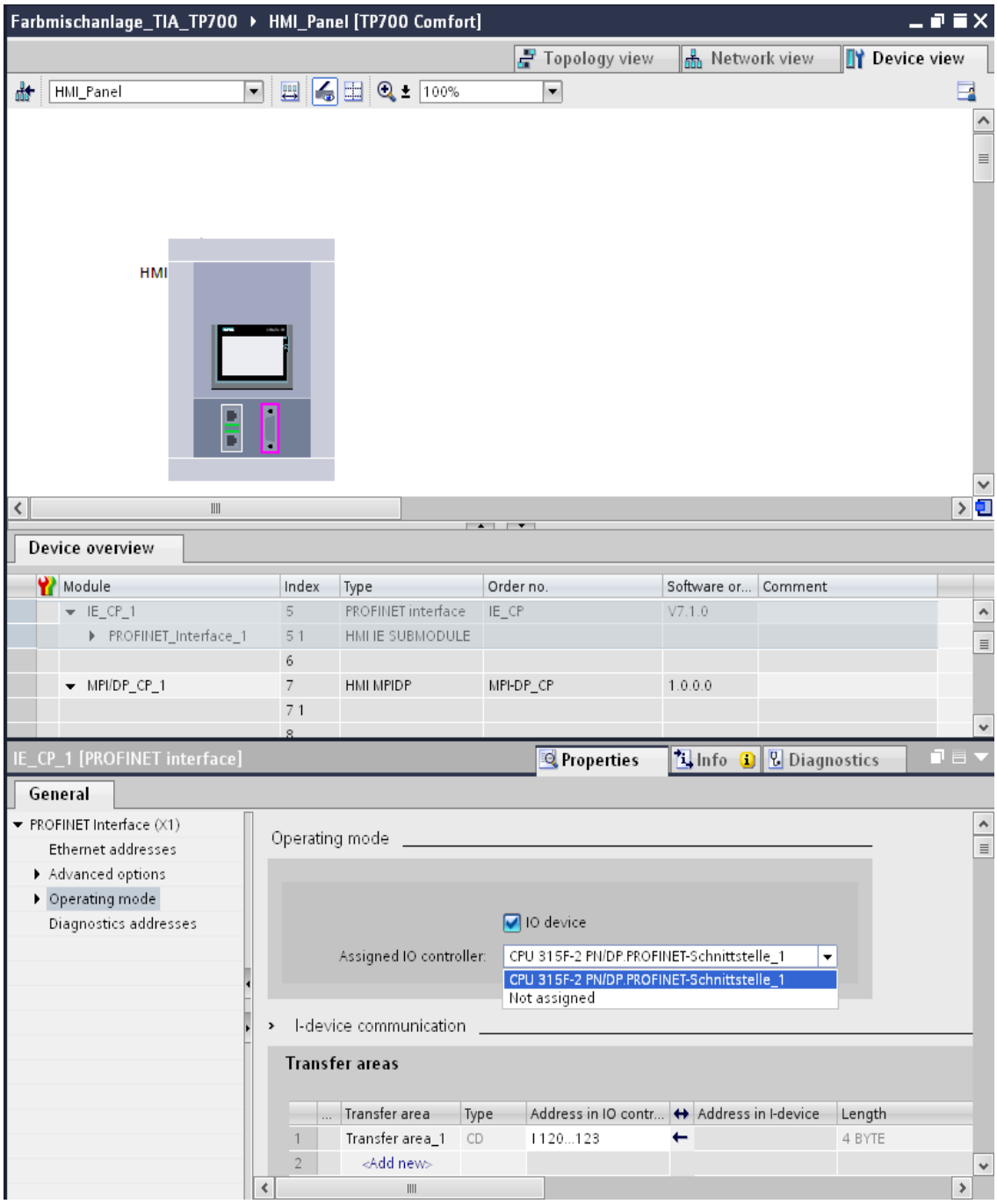
6.2 Setting the panel as PROFINET IO device

Set the check mark for **IO-Device** under Operating mode and select the **CPU 315F-2 PN/DP PROFINET interface_1**.



Click “Save project”.

Close the device configuration of the panel.

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7. Configuring screens

A screen can consist of static and dynamic elements. Static elements, such as text and graphics, are not updated by the controller.
Dynamic elements are connected to the controller and visualize current values from the controller's memory. Visualization can be in the form of alphanumeric displays, trends or bars. Dynamic elements are also inputs on the HMI device that are written to the controller's memory. **Tags** are used for the connection with the controller.

To begin with, the four automatically generated screens are to be configured for our color mixing station.

Root screen

This screen is already set up automatically and is also defined as start screen.
The entire plant is displayed here.
You can switch the operating mode or start the mixing process, the manual operation of the mixer motor and the opening of the drain valve using buttons.
The motion of the mixer and the states of the valves are displayed in graphic form.
The filling capacities of the individual admixtures are indicated via input fields.
Jumping to other screens should also be possible.
The "System screens" button can be used to make system settings on the panel, for example.

Tank 1

The valves from Tank 1 can be operated in manual mode in the Tank 1 screen. The maximum and minimum filling capacity can be set on the sliders. The supply and drain valve can be opened or closed using buttons (Open valve).
The valves are displayed in graphic form and change their color in the open state.
The fill level is displayed in red. When the maximum fill level has been reached, the supply valve is closed in automatic mode. If the tank is completely full, the supply valve cannot be opened.
Other buttons are used to switch to other tanks or to the root screen.

Tank 2, Tank 3

The Tank 2 and Tank 3 screens are structured like the Tank 1 screen.
The valves and the fill level of Tank 2 are displayed in green.
The valves and the fill level of Tank 3 are displayed in blue.

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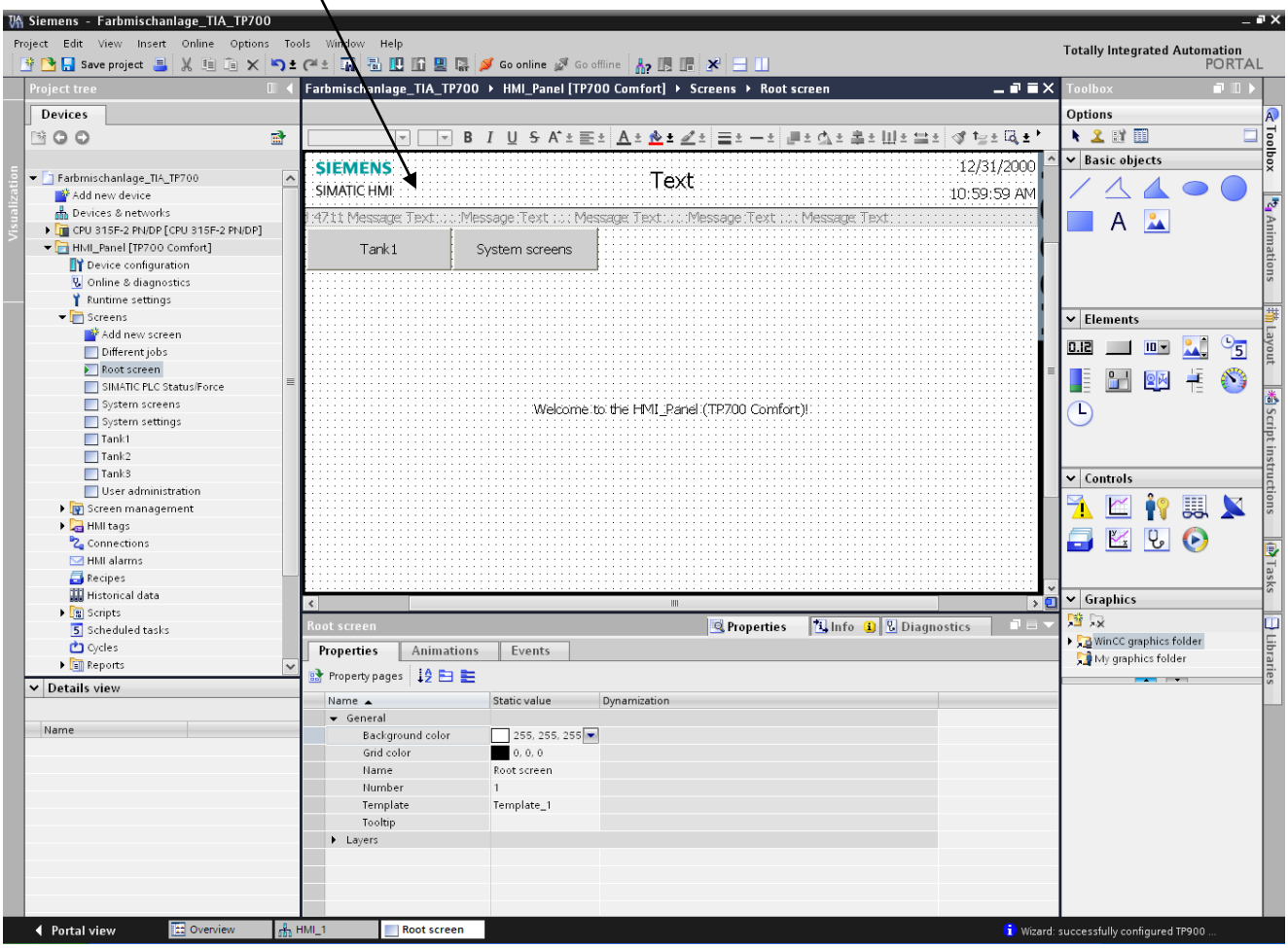
7.1 Root screen

Open the root screen of the HMI_Panel [TP700 Comfort] with a double-click.

Permanent overview area

The automatically generated screens contain a permanent window in the upper section.
The permanent area (overview) is also displayed in all newly added screens.



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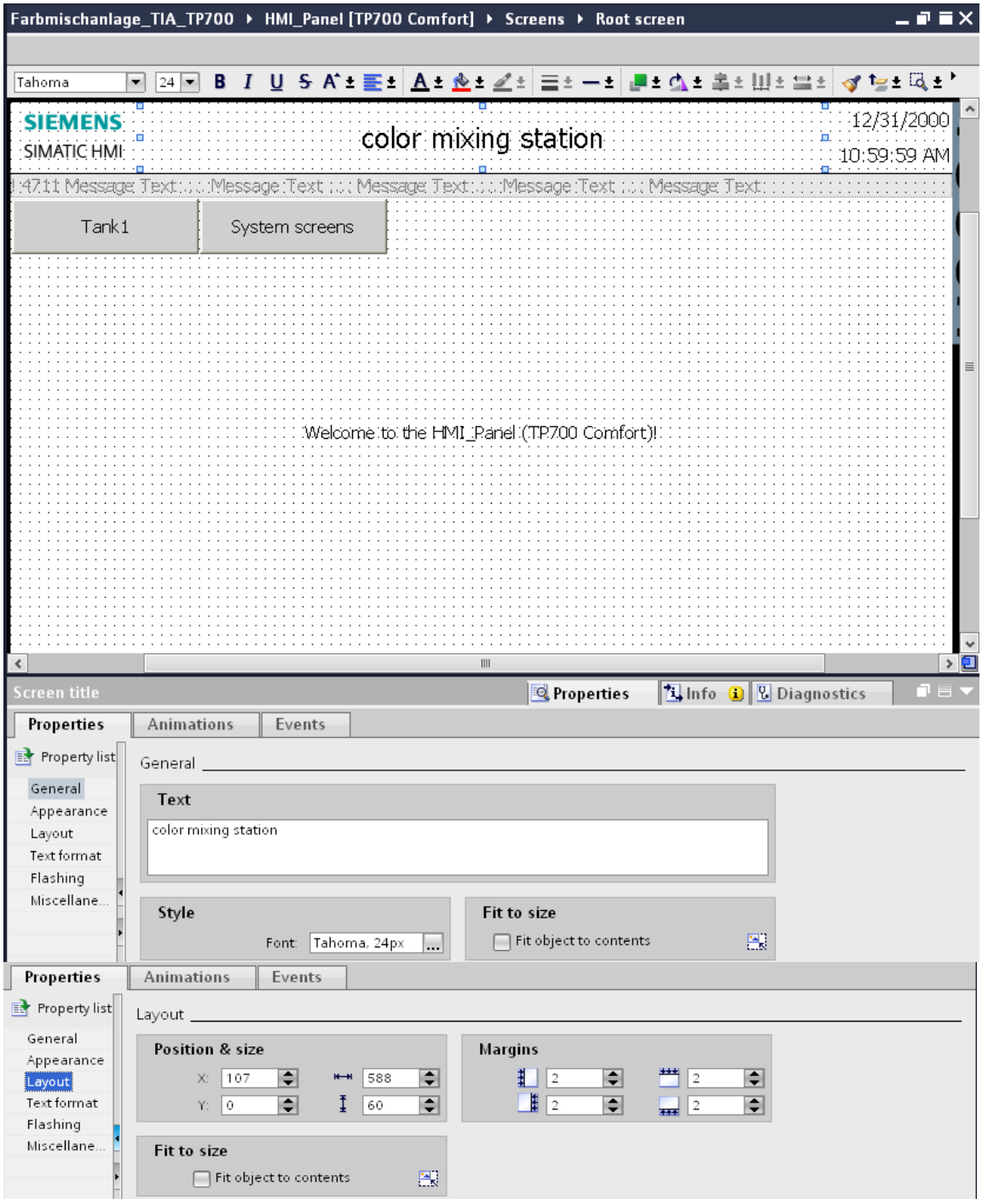
In the permanent window, change the screen title to **Color mixing station** under General and the **Position & size** and **Margins** of the text field under Layout.



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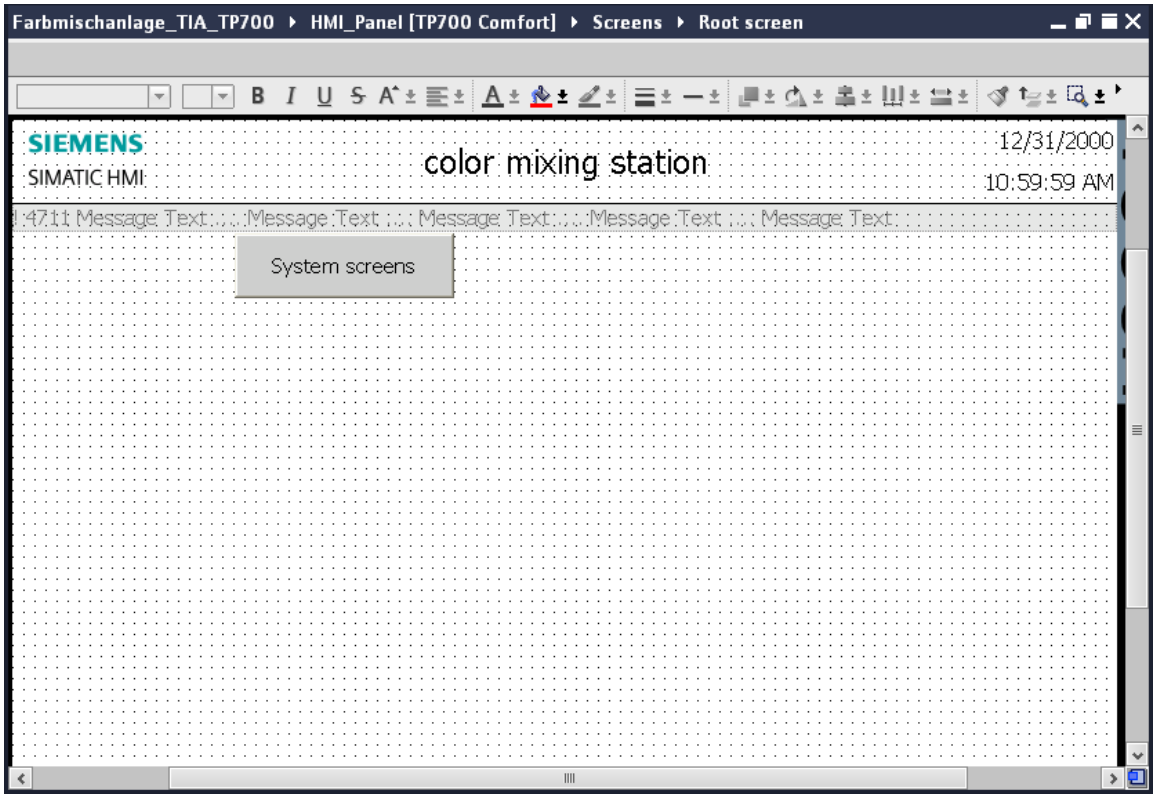
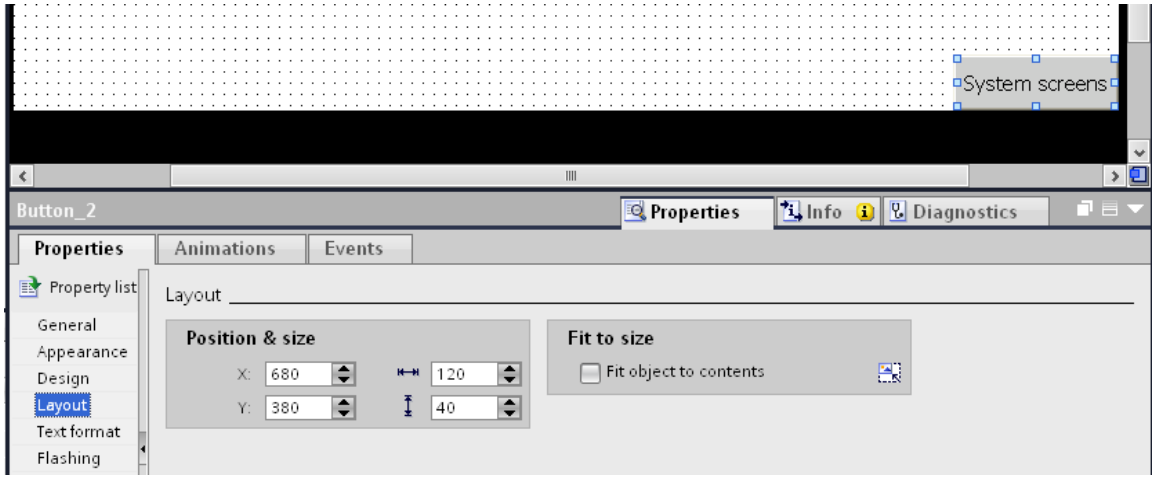
Root screen display area

In the root screen, delete the text field in the center of the screen and the Tank 1 button.


Farbmischanlage_TIA_TP700 ▸ HMI_Panel [TP700 Comfort] ▸ Screens ▸ Root screen
SIEMENS
SIMATIC HMI
color mixing station
12/31/2000
10:59:59 AM
4711 Message Text ... Message Text ... Message Text ... Message Text ... Message Text
System screens

Under Layout, change the **Position & size** of the **System screens** button.



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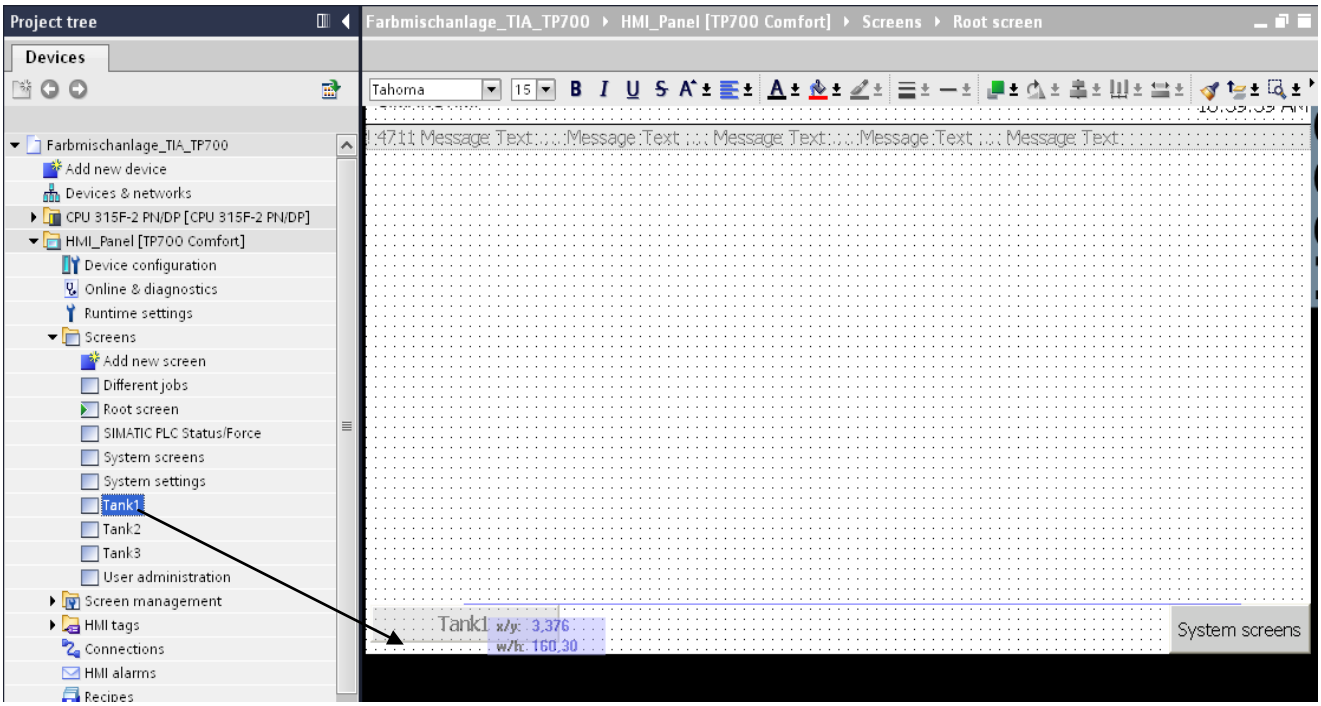
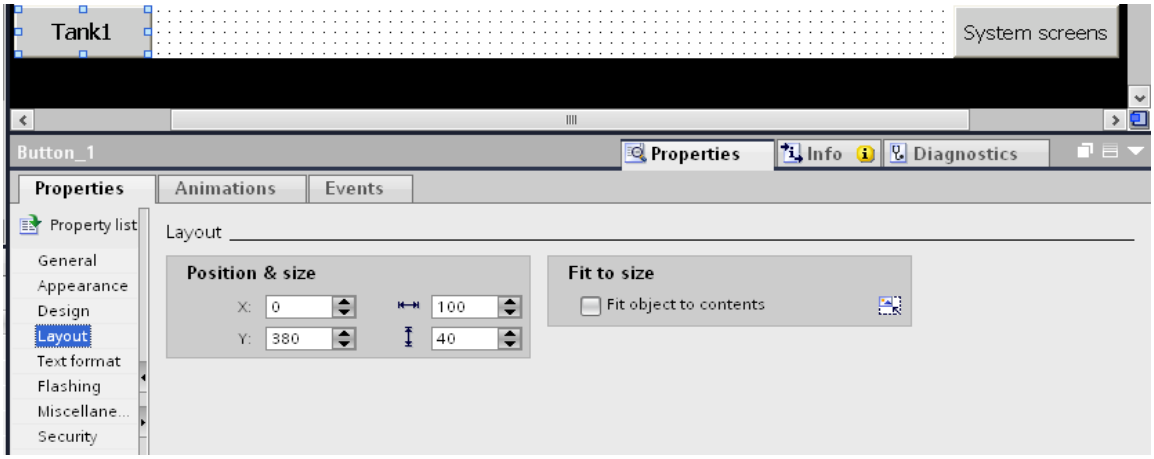
Configuring screen changes

In each screen, a screen change to the other three screens should be possible using buttons.
In WinCC, the screen names need only be dragged from the project window to achieve this. The buttons are then generated automatically.



Under Layout, change the **Position & size** of the **Tank 1** button.



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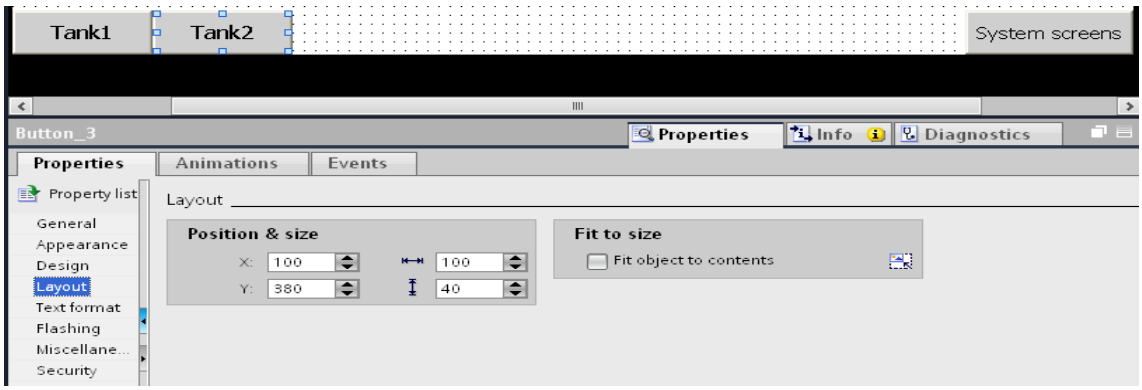
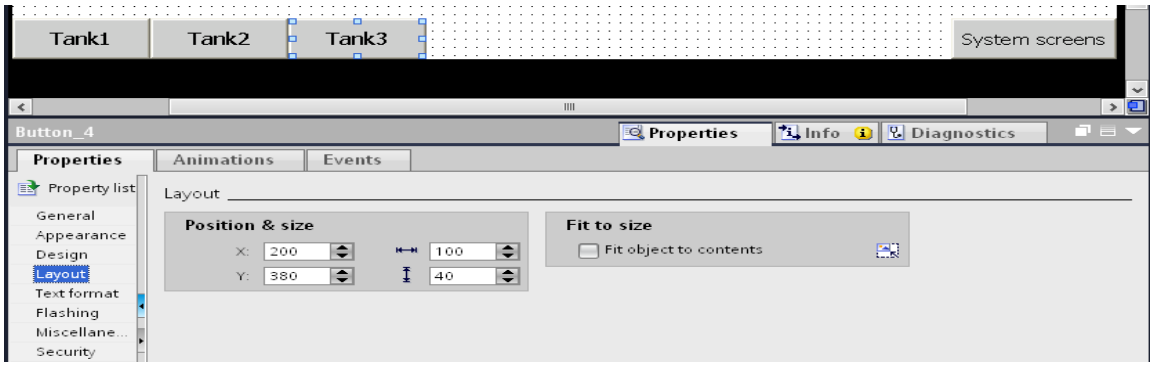
Insert the **Tank 2** button and change the **Position & size** under Layout.



Insert the **Tank 3** button and change the **Position & size** under Layout.



Make sure to **save the project** occasionally.

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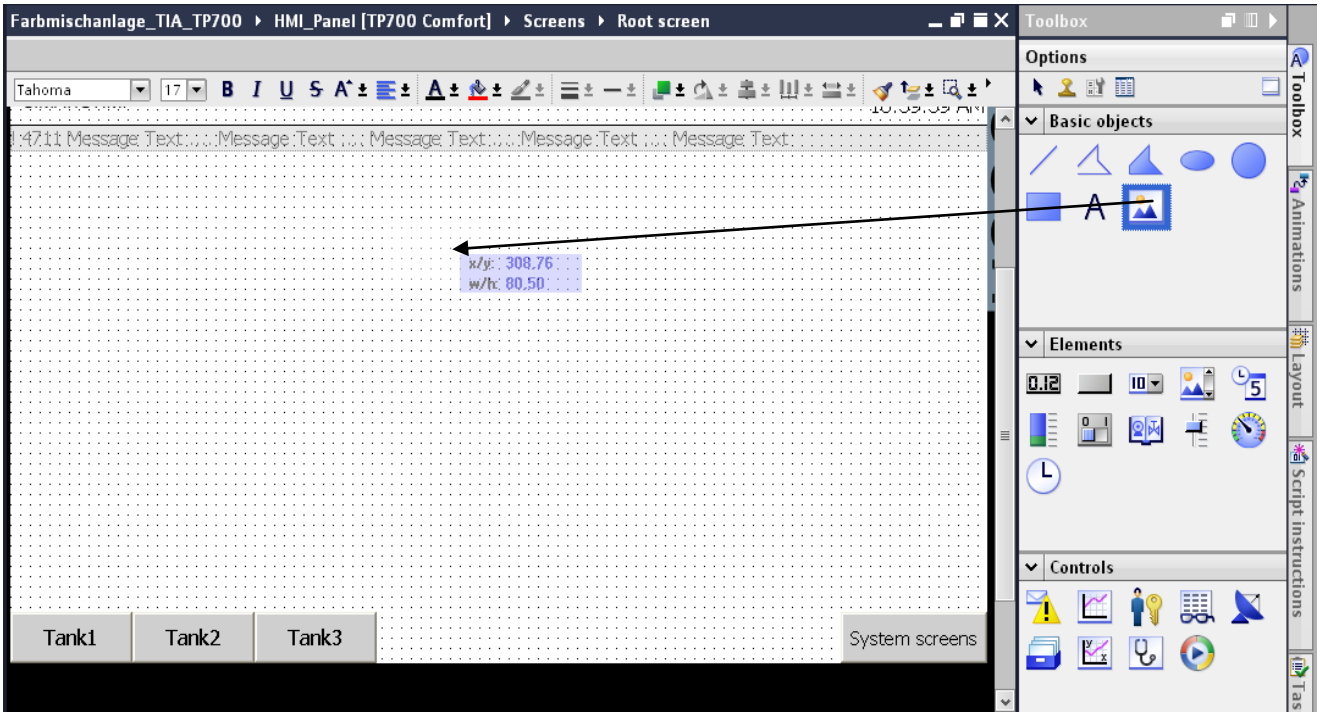
Inserting a graphic view

Drag a graphic view to the working area of the root screen.



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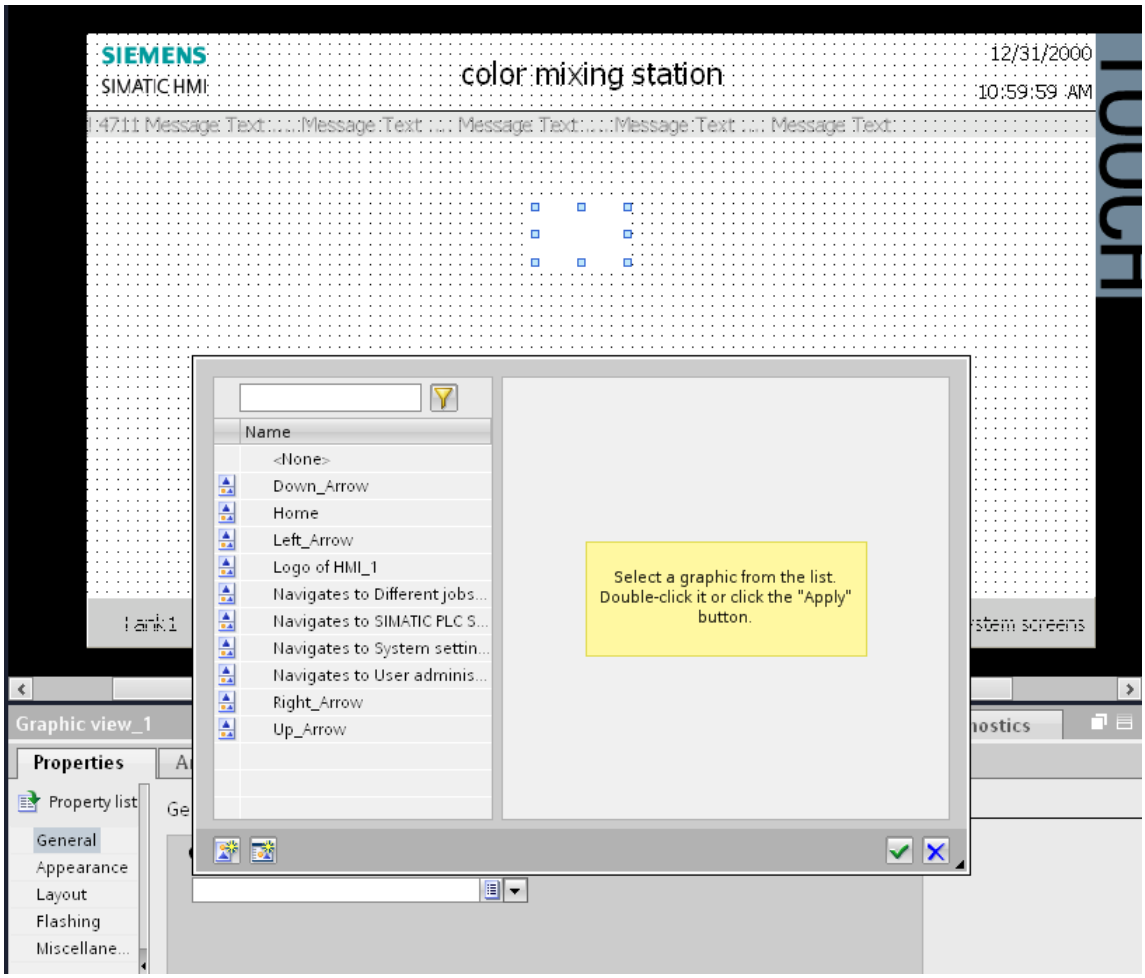
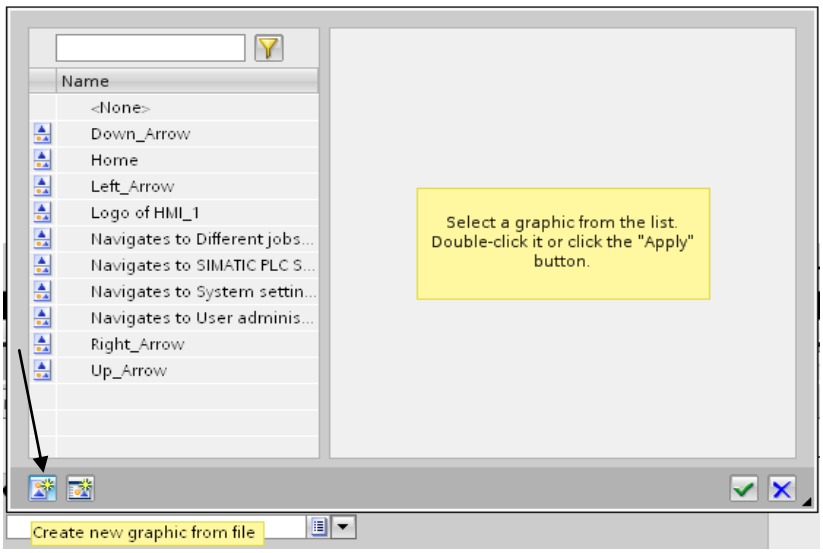
You can now choose graphics from the list in the properties window of the graphic view
You can use the buttons to create new graphics from files or OLE objects.
The selected graphic appears in the preview window and can be inserted.



You have two options for inserting graphics.

First option

Click **Create new graphic from file**.



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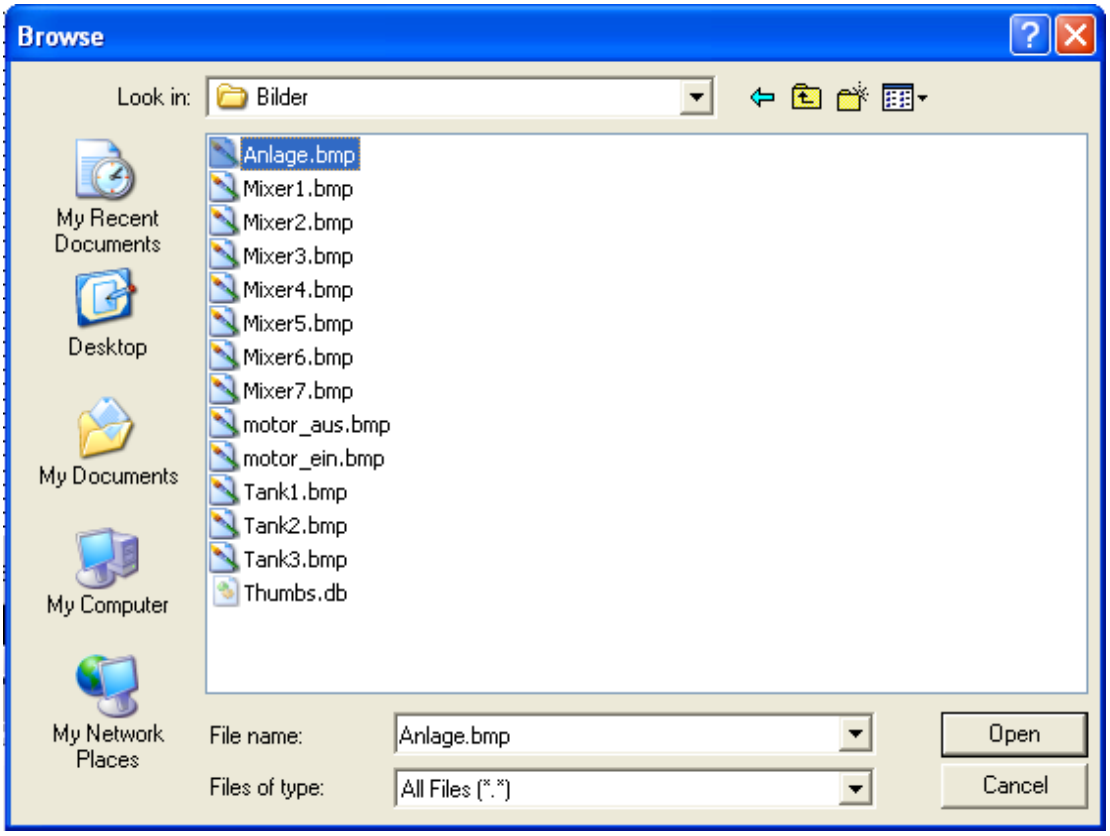
Select the file "Plant.bmp" from the Color Mixing Station_TIA templates directory.



Confirm your selection with **Open**.

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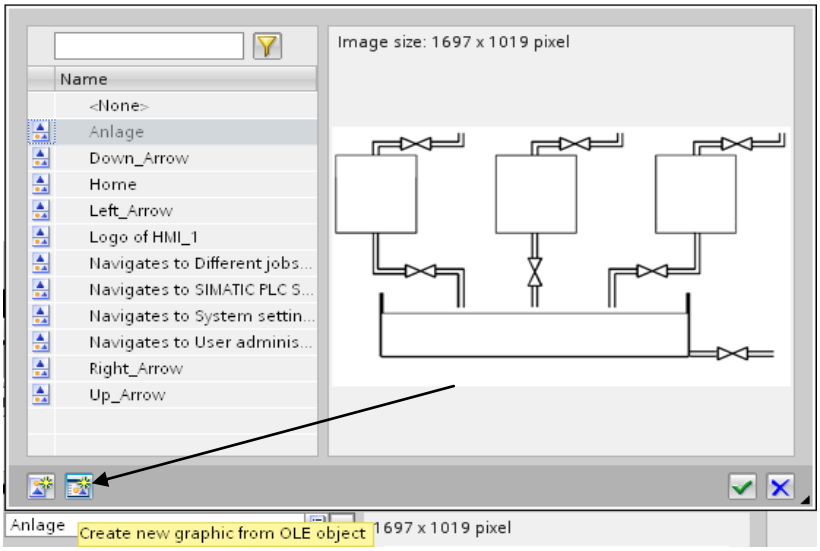
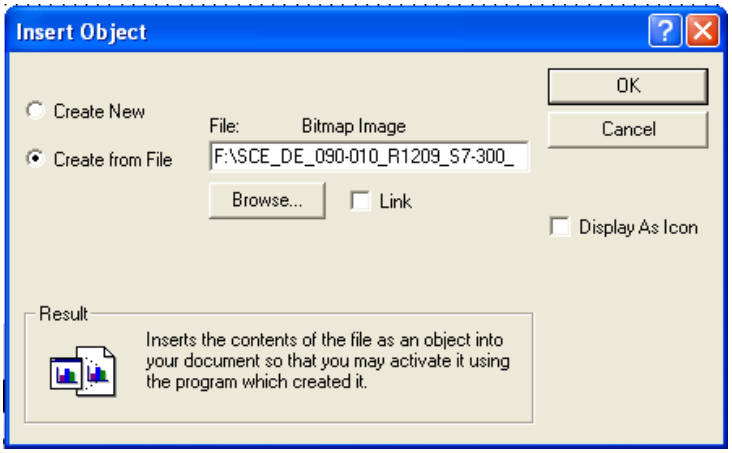
Second option

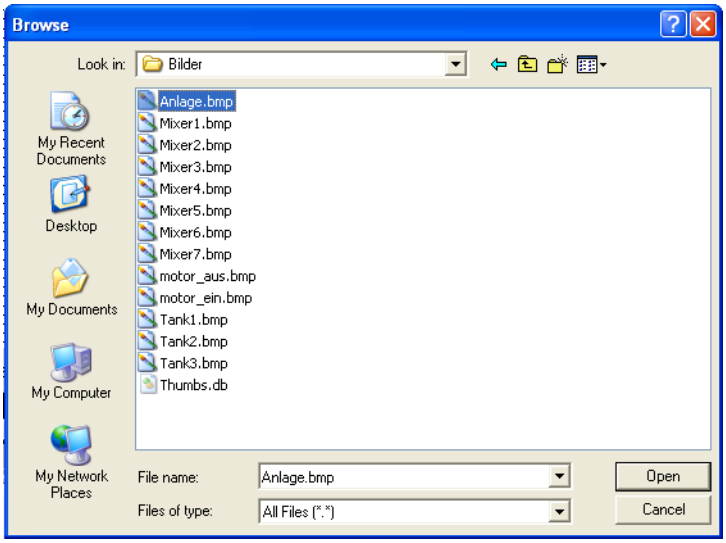
Click **Create new graphic from OLE object**.



Select **Create from File** and click **Browse**.



Select the image "**Plant.bmp**" and click **Open**.



In the next window, confirm your selection with **OK**

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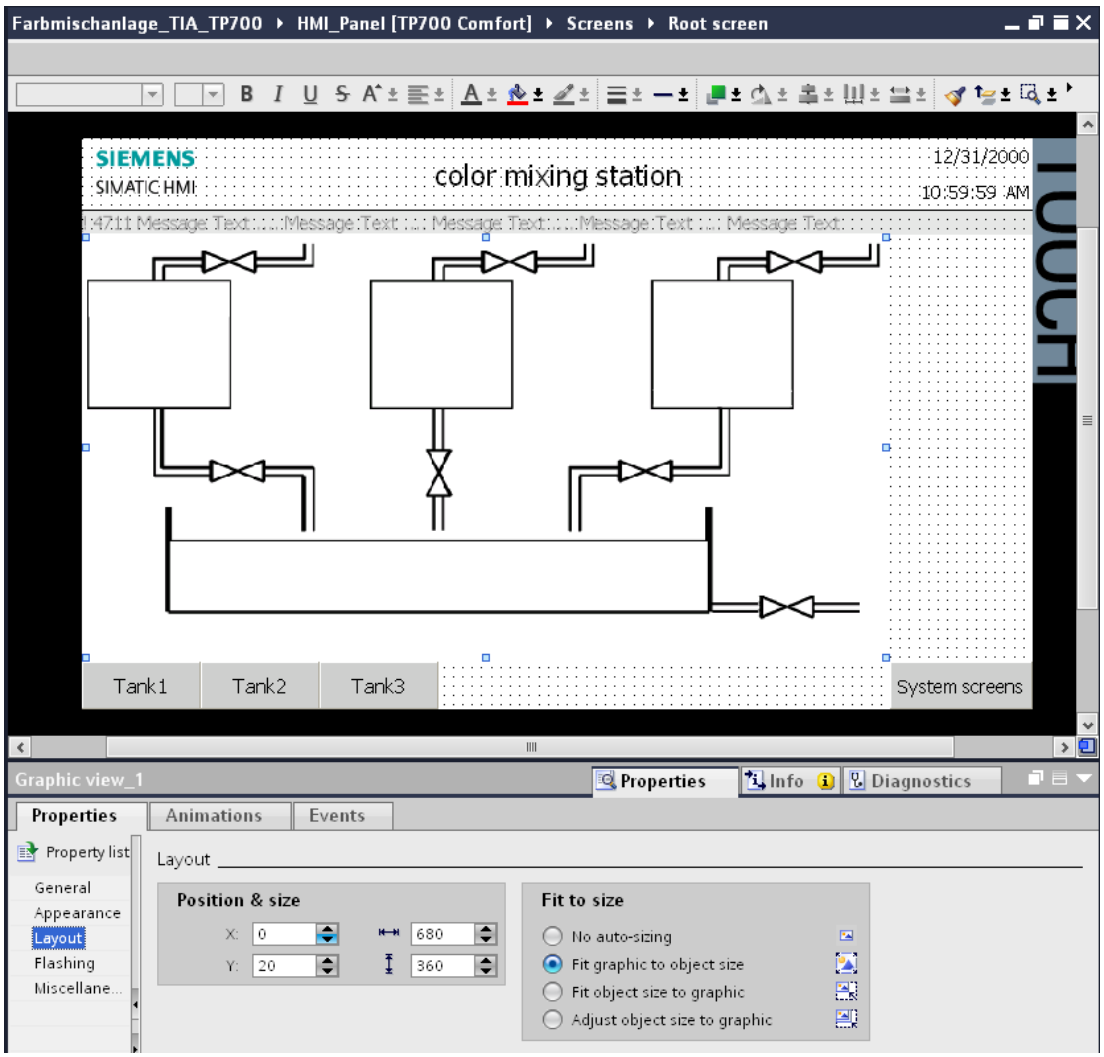
.

Under Layout, change the **Position & size** of the graphic view.



Remember to save the project!

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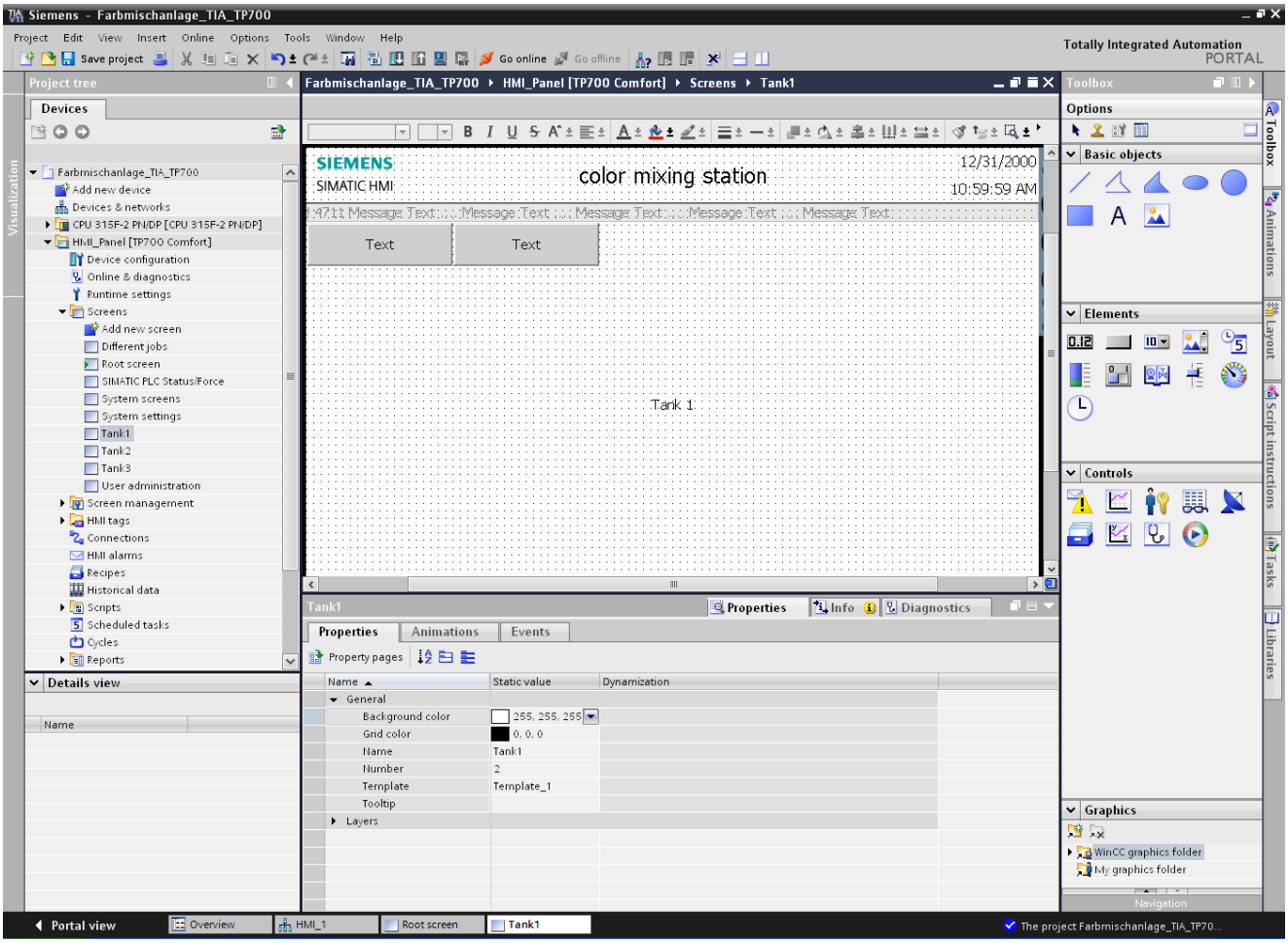
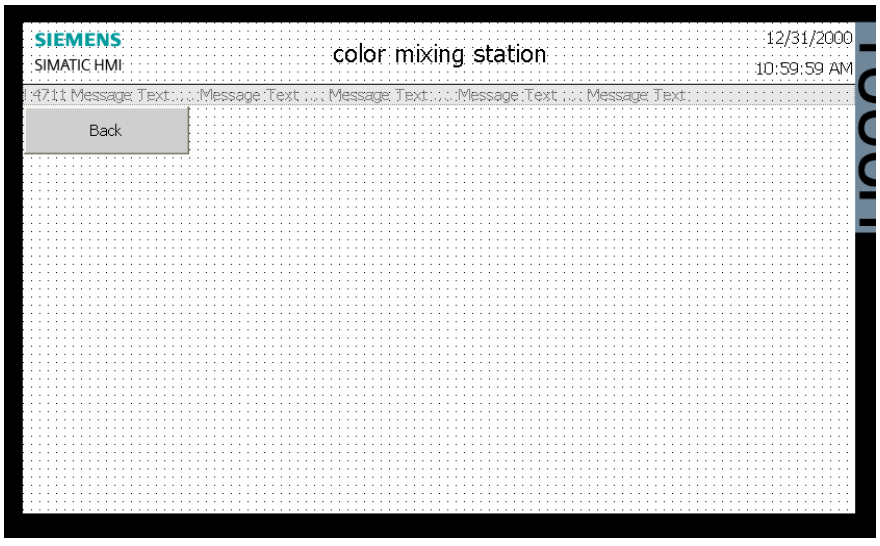
7.2 Tank 1 screen

Open the **Tank 1** screen with a double-click.



Delete the text field in the center of the screen and the Tank 2 button.



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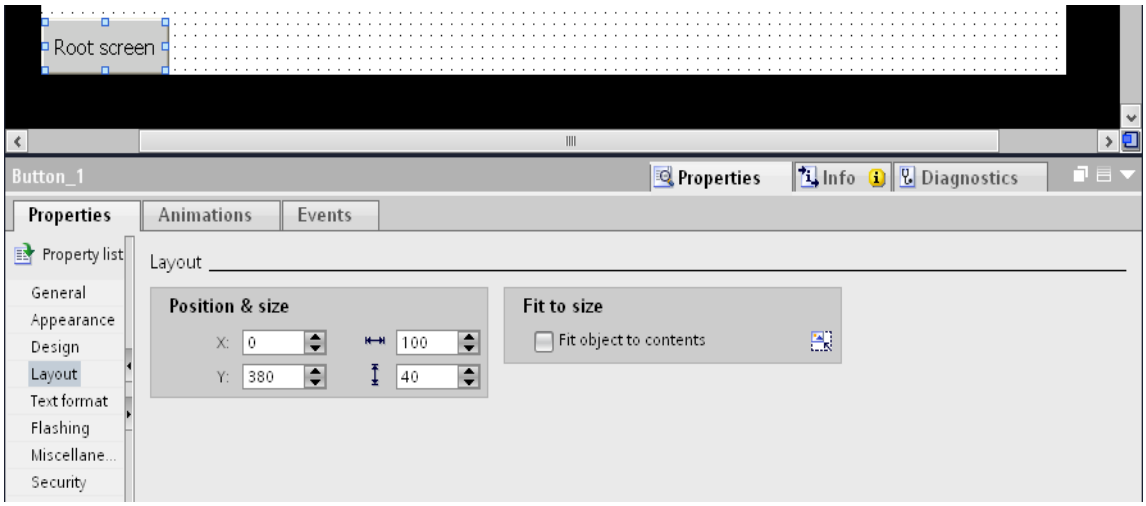
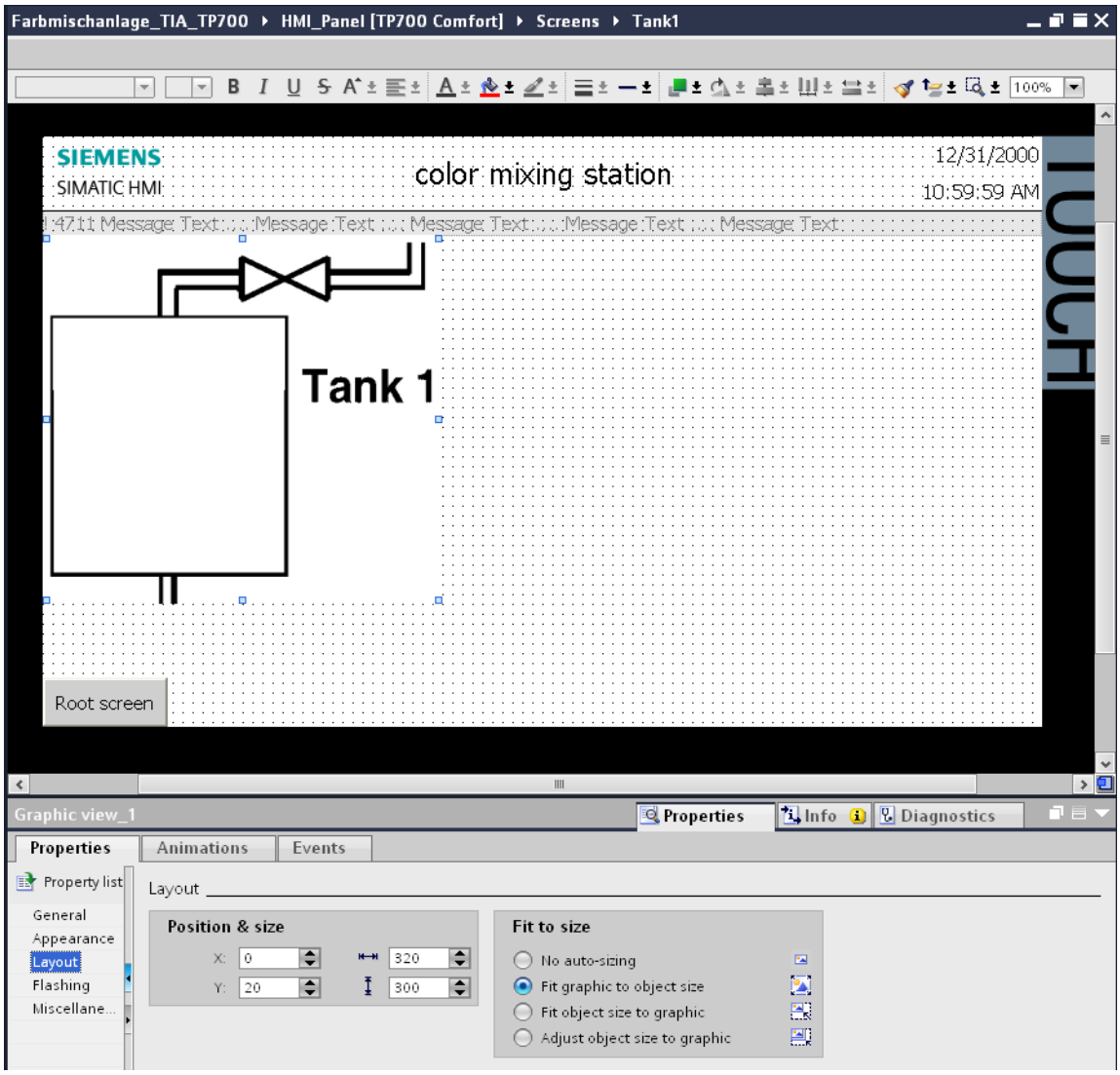
Under General, change the name of the button to **Root screen** and adjust the **Position & size** of the button under Layout.



Insert the **Tank1.bmp** image as graphic view.



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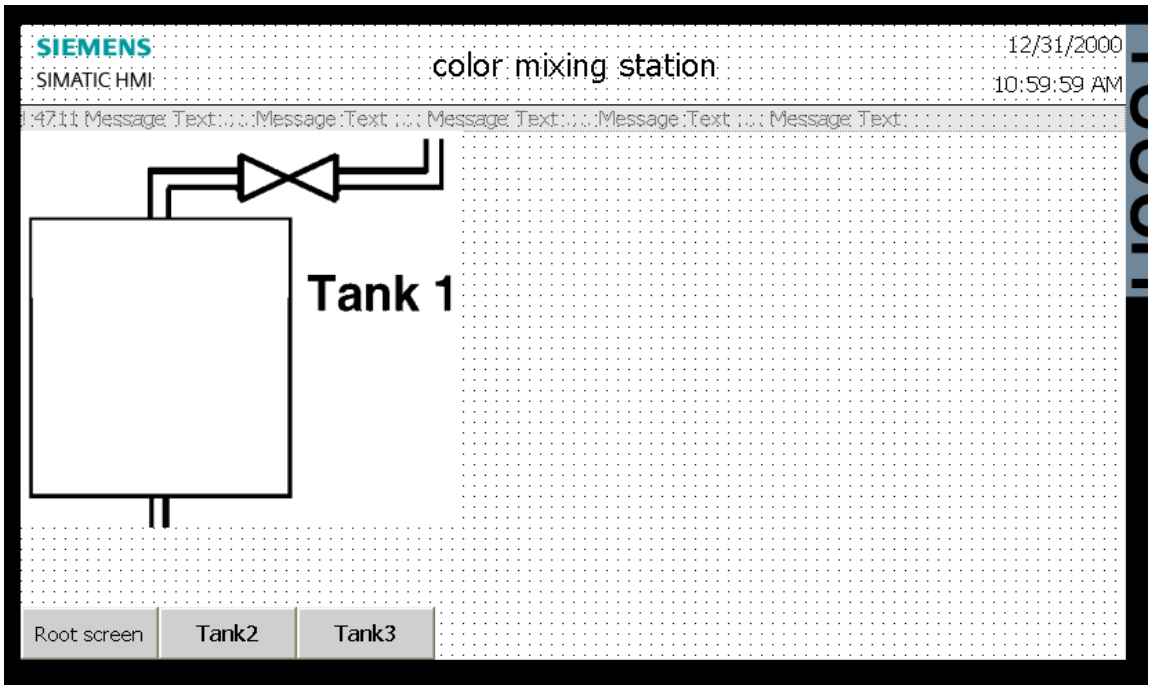
Copy the buttons **Tank 2** and **Tank 3** from the root screen and insert these in the Tank 1 screen.



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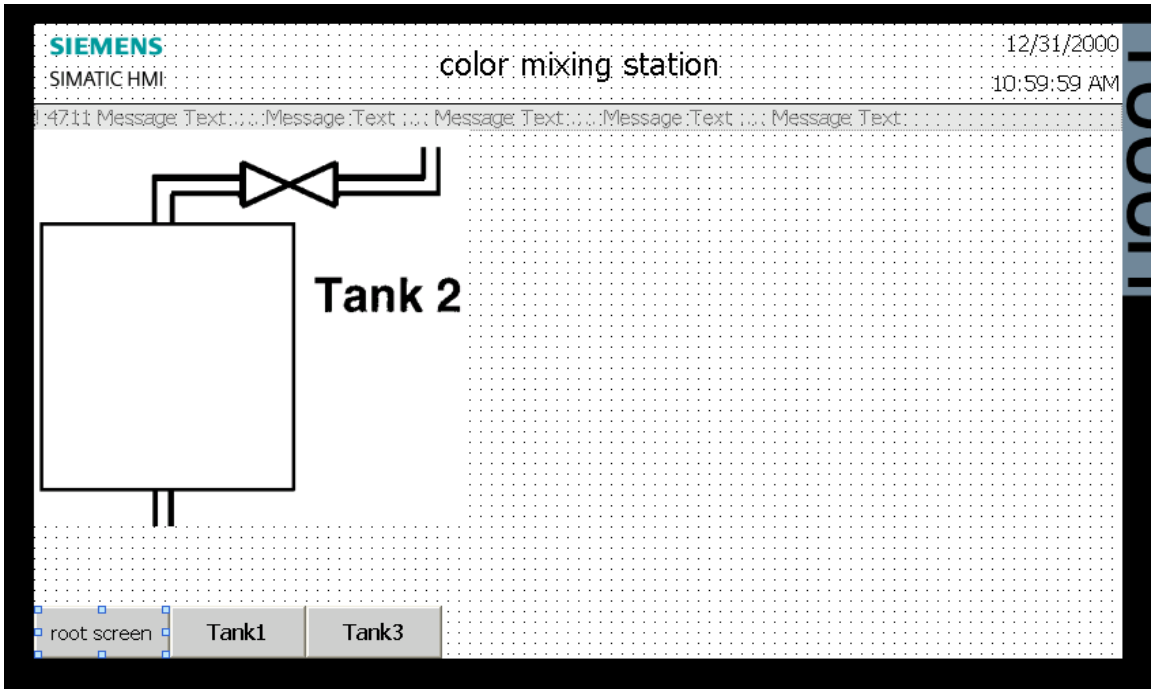
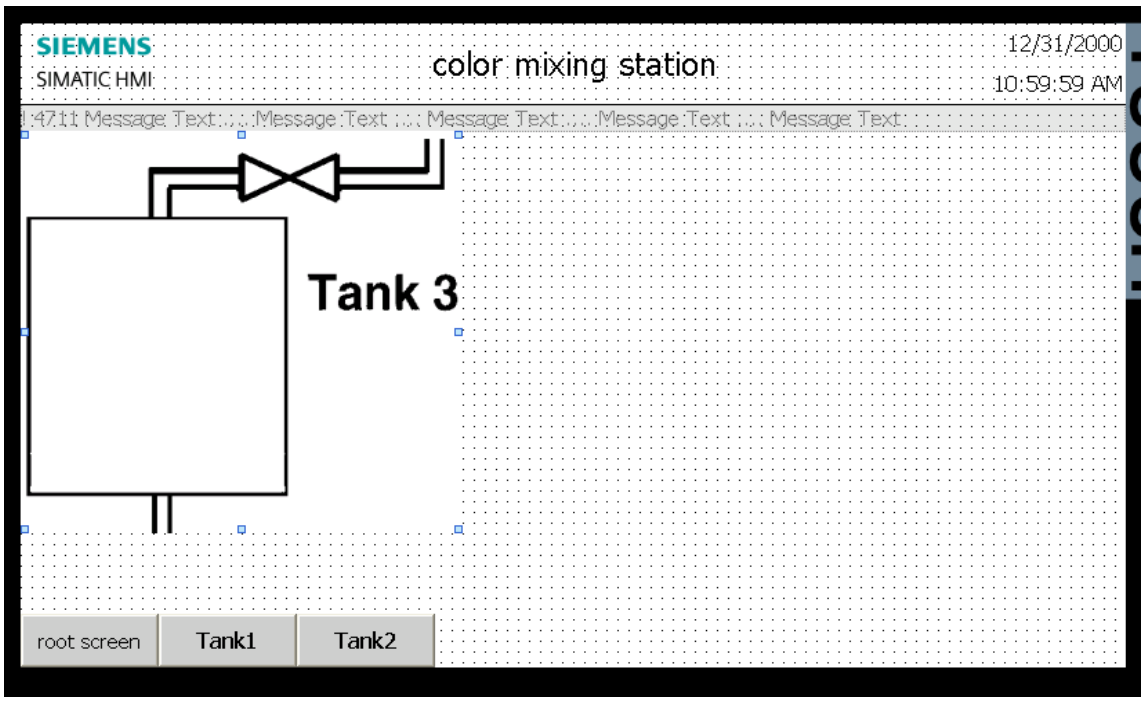
Repeat the work steps for the Tank 2 and Tank 3 screens.

7.3 Tank 2 screen



7.4 Tank 3 screen



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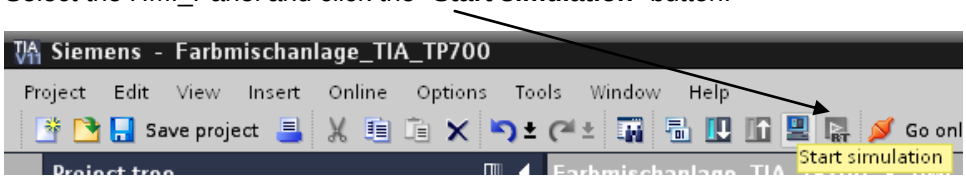
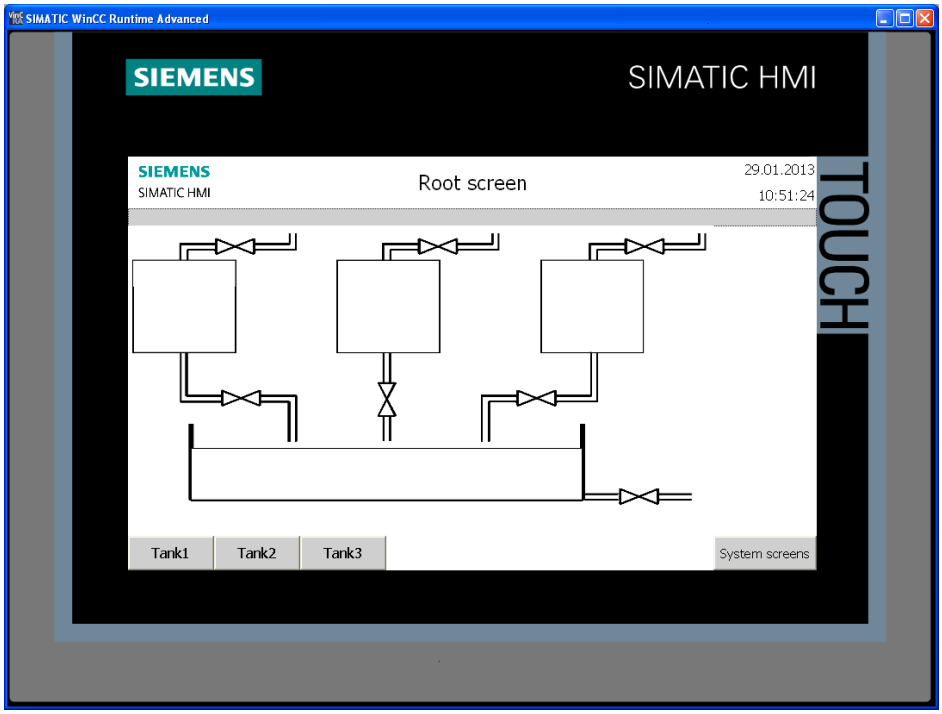
7.5 Testing configuration in Runtime

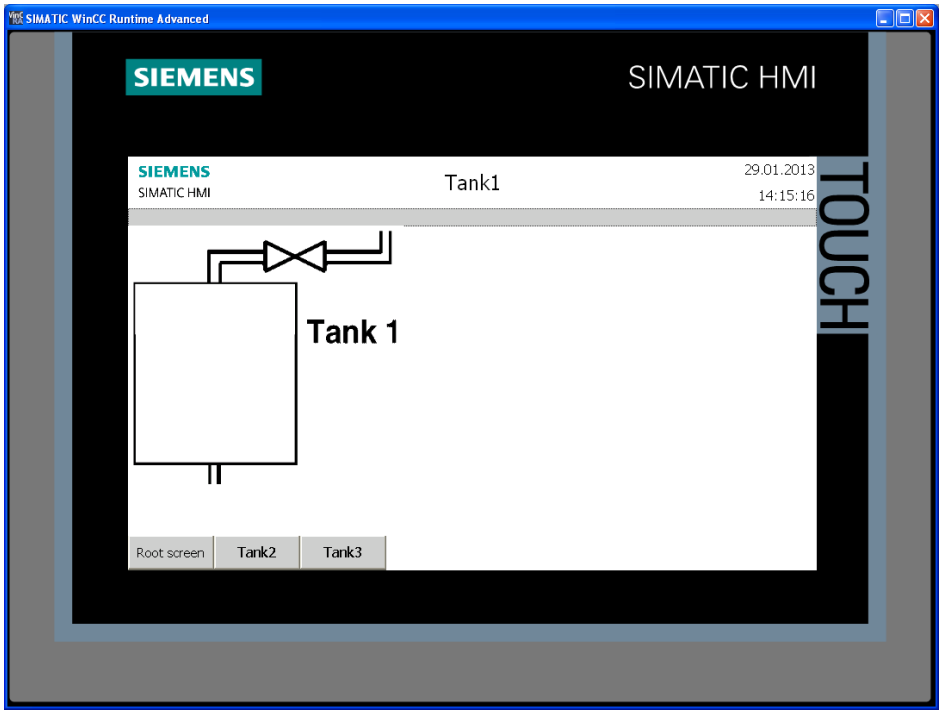
Select the HMI_Panel and click the "**Start simulation**" button.


Siemens - Farbmischanlage_TIA_TP700
Project Edit View Insert Online Options Tools Window Help
Save project
Start simulation

Root screen



Tank 1 screen



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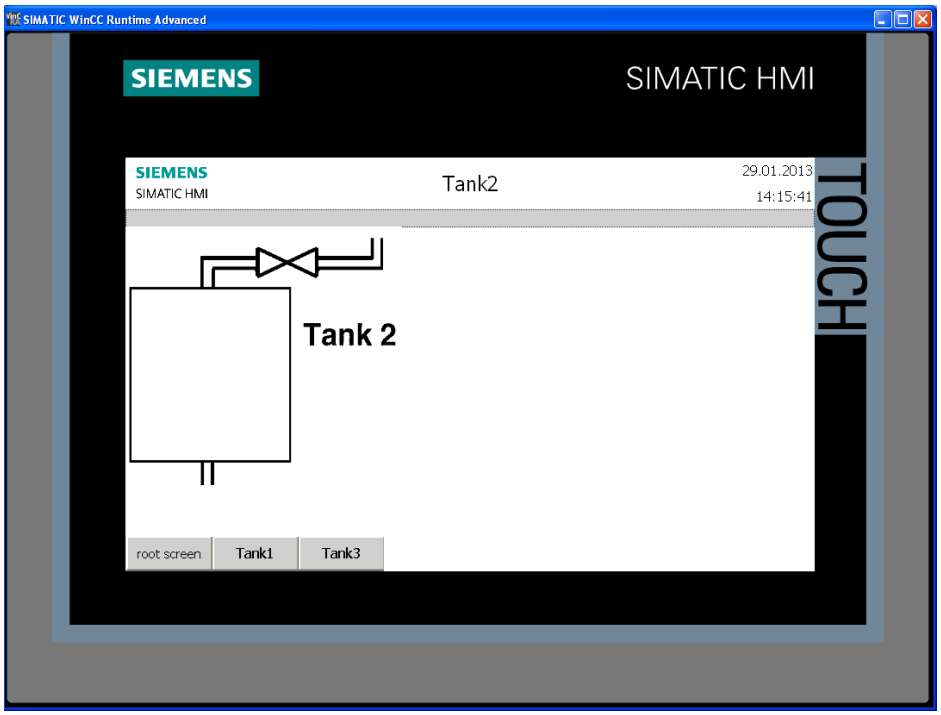
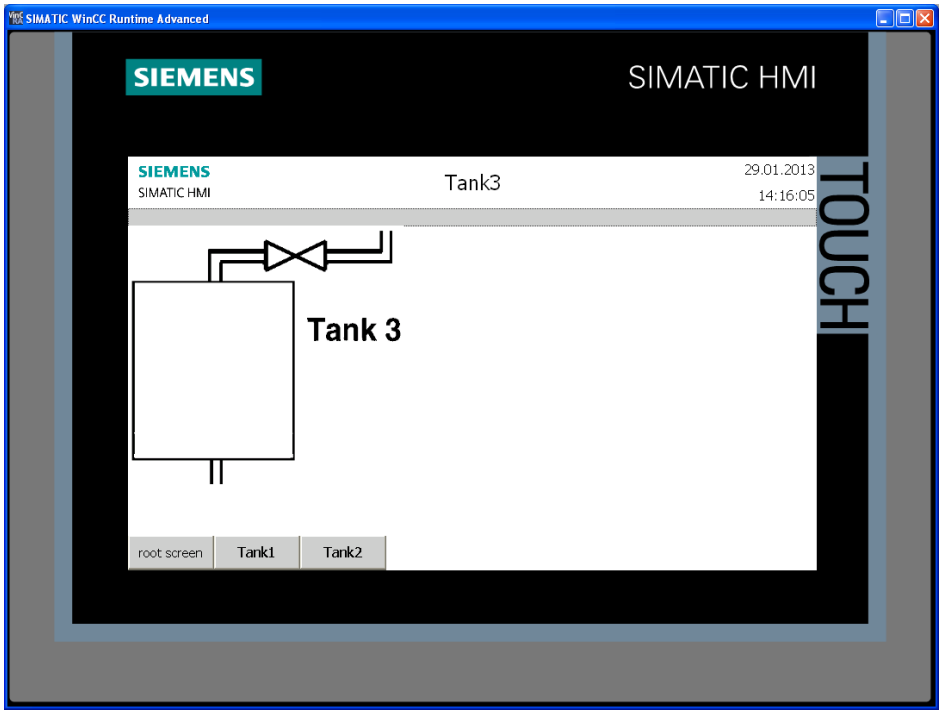
Tank 2 screen



Tank 3 screen



Test the function of the buttons in all screens

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8. Settings on the TP700 Comfort Touch Panel

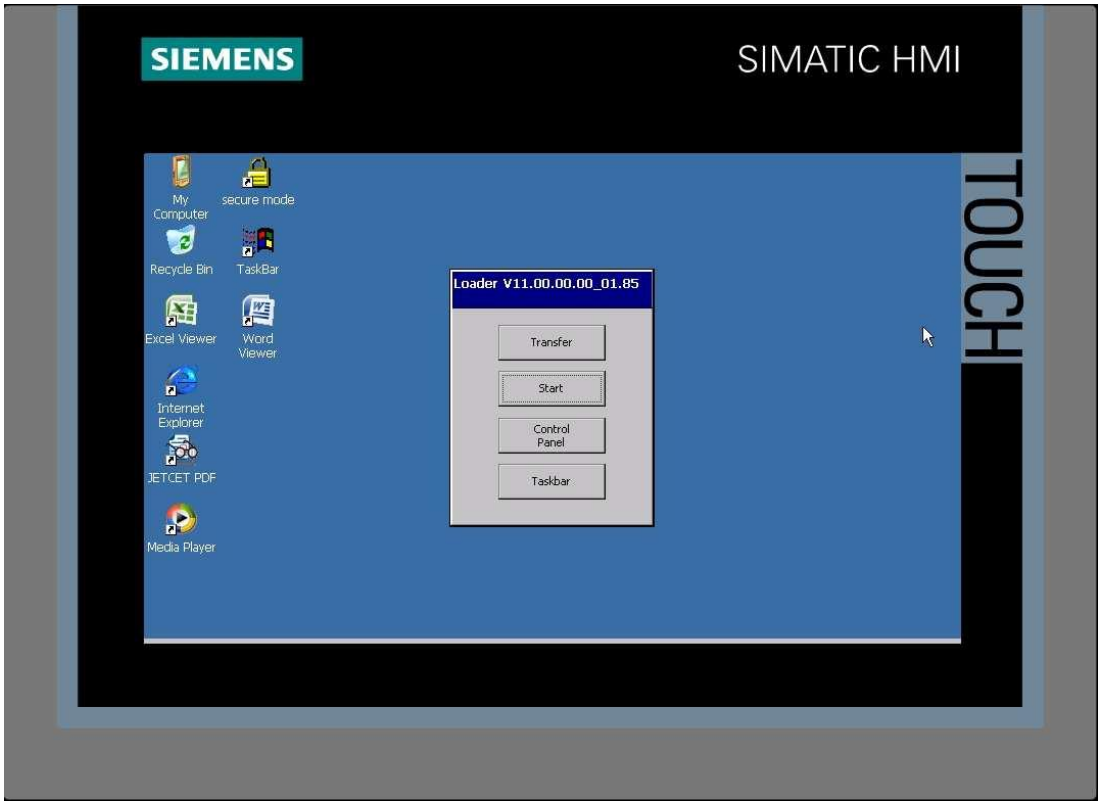
The most important panel settings have already been made in the device configuration of the panel in the WinCC project.

Select the HMI_Panel [TP700 Comfort] and click the **Load to device** button.
These settings are written to the panel during loading.

The most important settings can also be made directly on the panel.

The Touch Panel TP700 runs under the Windows CE operating system and can be operated, like all touch panels, directly on the screen. To make operation easier, you should use a touch pen or connect a mouse to the panel's USB port.

The desktop and the Loader window appear after the panel starts up.
At the bottom edge of the screen, there is a taskbar which you can use to start programs or adjust program settings, like with other Windows systems.



Loader buttons:

Transfer: Data transfer becomes active and data can be read in from WinCC flexible.

Start: Runtime is started and the process visualization appears on the panel.

Control Panel: Windows CE Desktop opens.

Taskbar: The taskbar opens.

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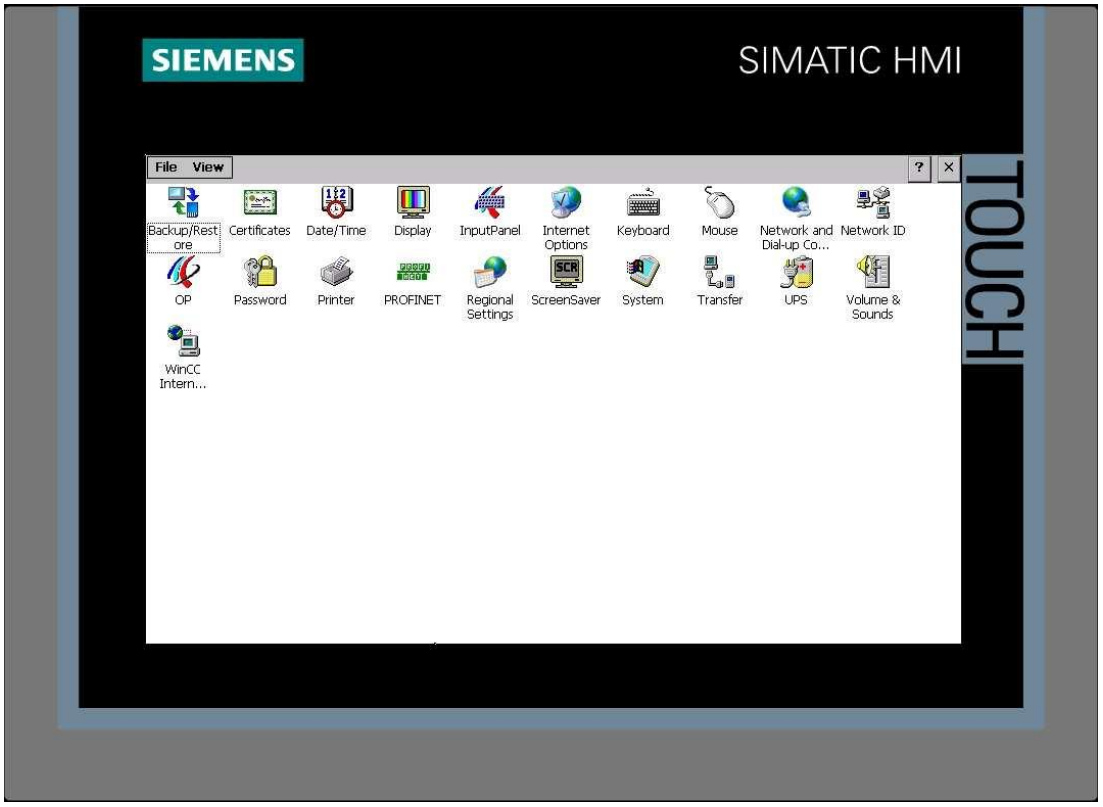
8.1 Setting the date and time

Use the **Control Panel** button to set the date and time.
The Windows CE desktop opens.
Use the **Date/Time** button to make the settings.



Set the time zone, date and time. Click **OK** to confirm.

Date/Time Properties
OK
Date/Time
April 2012
M D M D F S S
26 27 28 29 30 31 1
2 3 4 5 6 7 8
9 10 11 12 13 14 15
16 17 18 19 20 21 22
23 24 25 26 27 28 29
30 1 2 3 4 5 6
Current Time
18:14:00
Time Zone
(GMT+01:00) Amsterdam, Berlin, Bern, Rc
Daylight savings time currently in effect
Apply

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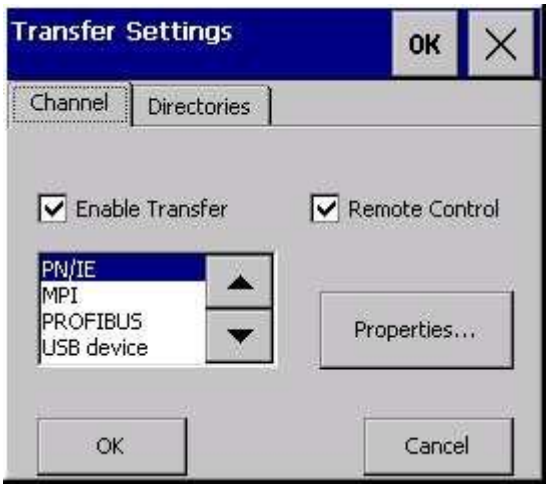
8.2 Setting transfer properties

On the desktop, press the icon

Select **PN/IE** under Channel.
Select the **Enable Transfer** check box and the **Remote Control** check box.



The settings in the Transfer Settings window have nothing to do with the connection settings in the WinCC project.
This means, for example, that data can be transferred between the TP700 Panel and WinCC using the Ethernet interface, and that communication between the panel and the SIMATIC S7 controller can take place using the MPI interface.

In our example, data is transferred between the TP700 Panel and WinCC and communication takes place between the panel and the SIMATIC S7 controller by means of the Ethernet interface.

To set the IP address on the panel, click **Properties** to edit or check the network settings.
To set the MPI or PROFIBUS address on the panel, click **Properties** to edit or check the bus settings after the selection of the interface.

Select the **PN/IE** interface.
Click **OK** to confirm.

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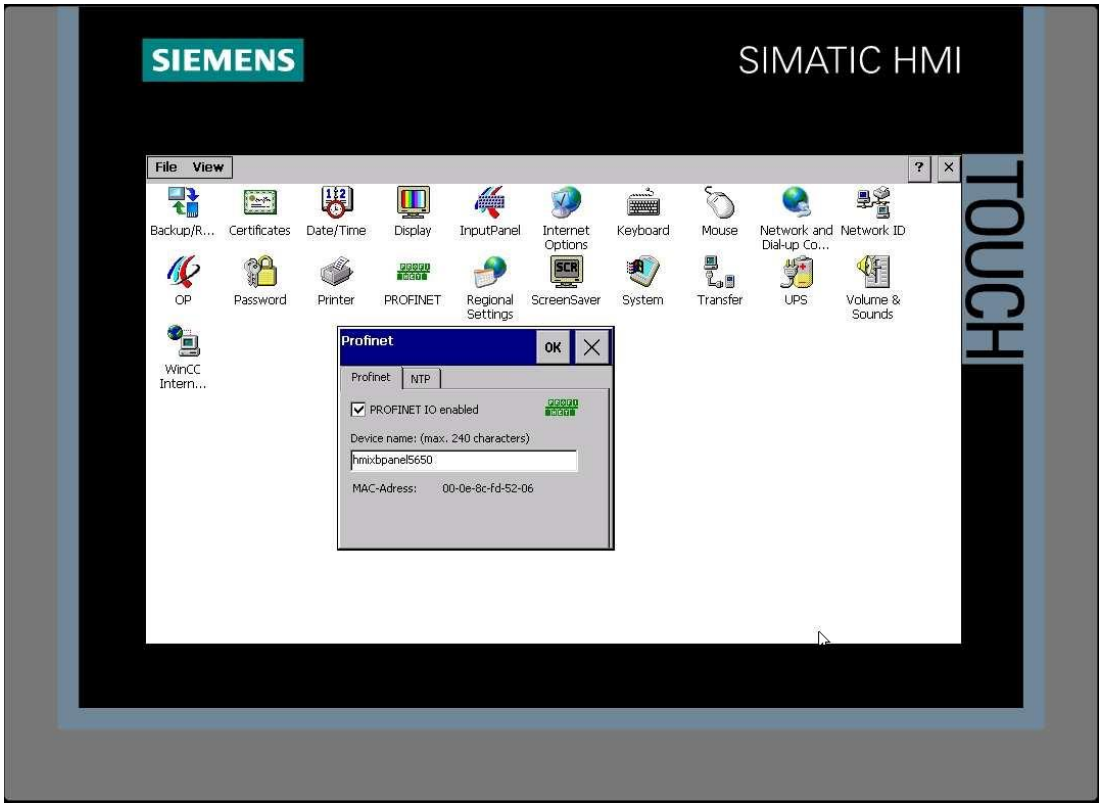
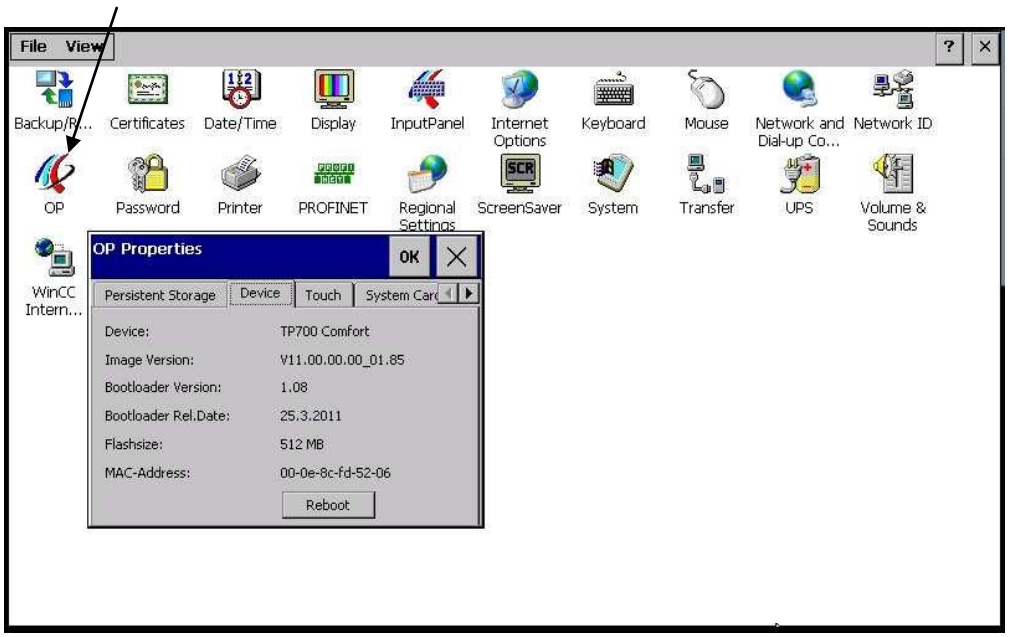
8.3 Assigning PROFINET device names

Double-click the **PROFINET** icon on the desktop. Select the **PROFINET IO enabled** check box and enter **hmixbpanel5650** as the device name of the panel.



8.4 Reboot

The panel can be booted under the **OP** Properties.
All the settings are applied after the reboot.



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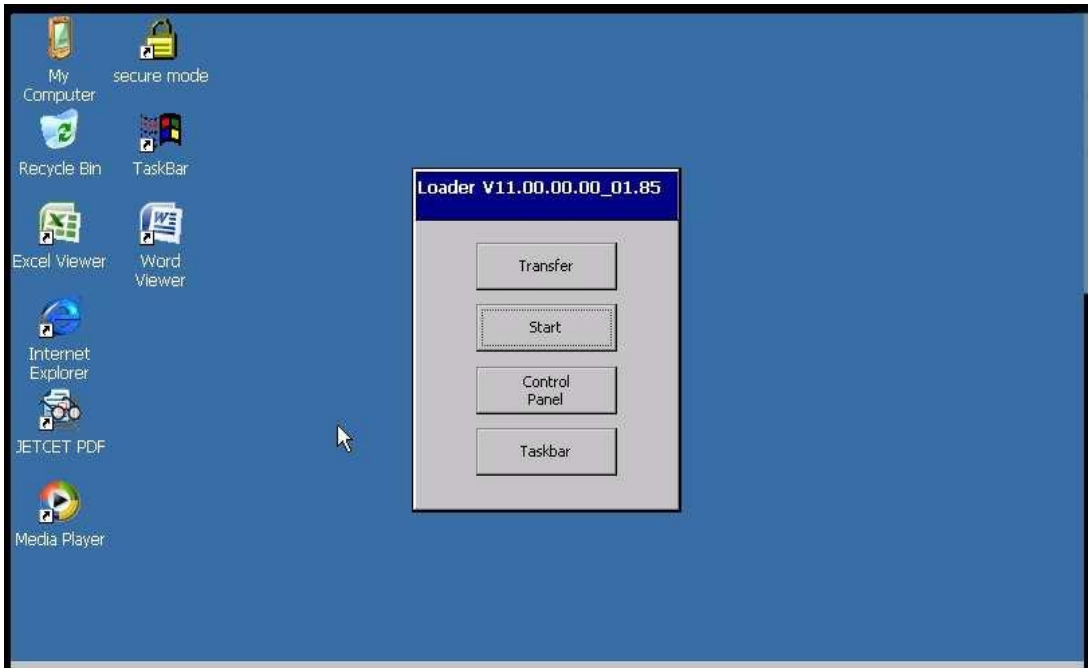
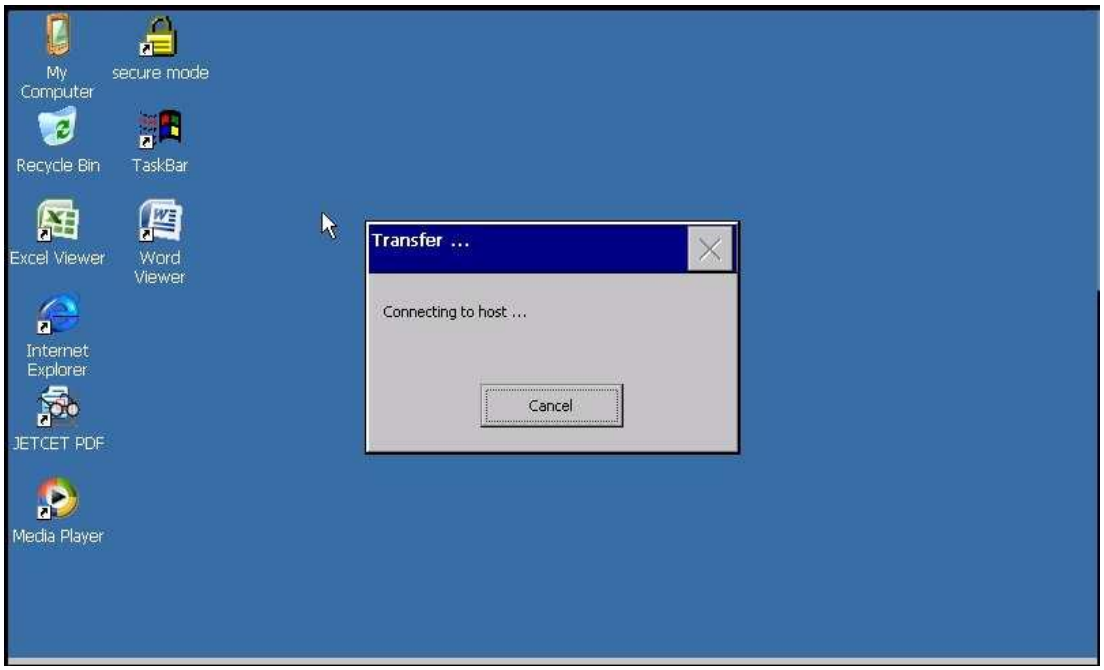
8.5 Transfer mode

After the “reboot”, the panel is automatically set to transfer mode.
If the panel already contains a configuration, Runtime is started after a few seconds.



Connecting to host… appears in the Transfer window.



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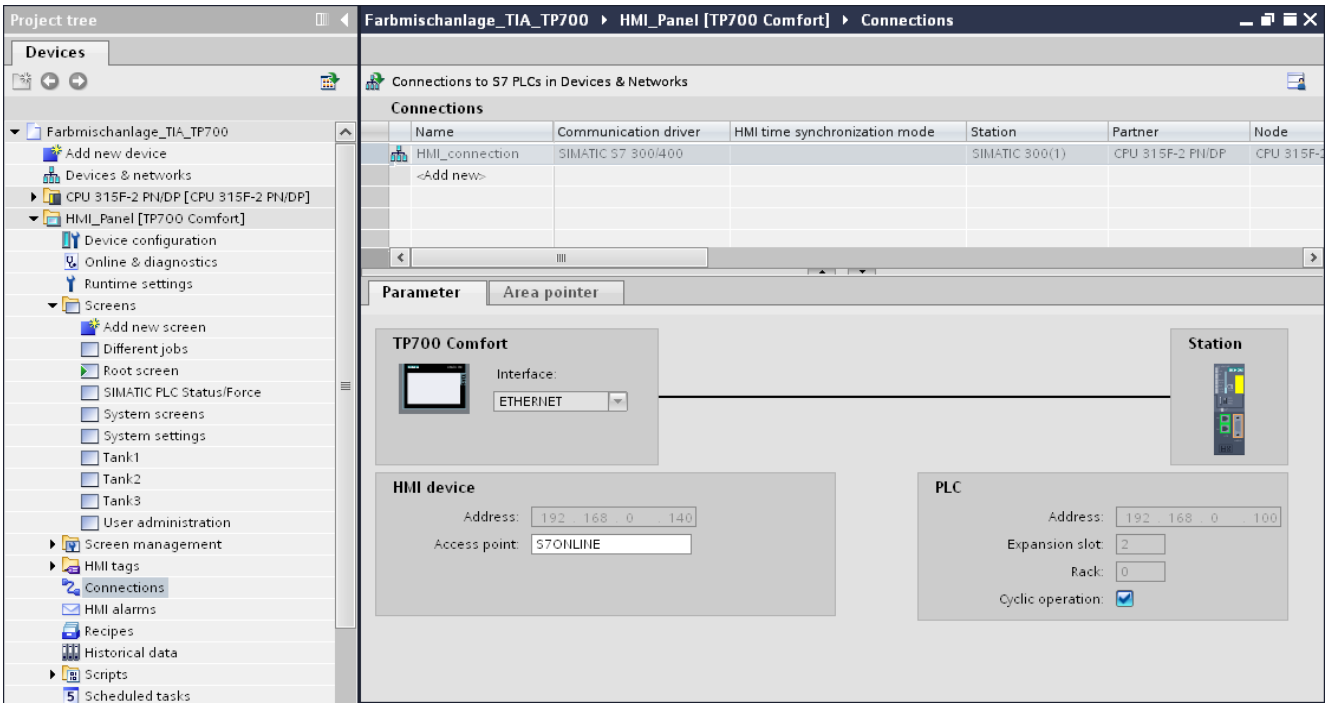
8.6 Configuring a connection

Until now, we have worked in our project without access to the SIMATIC S7 controller.
We also want to display fill levels and enter fill quantities on our panel.
For operating and display objects that access the process values of a controller, a connection to the controller has to be configured first.
Here, you specify how and via which interface the panel communicates with the controller.

Double-click **Connections** in the project window.
All parameters have already been set by the settings in the device configuration.



Save the project.

The bus error LED on the CPU goes out after successful loading to the panel.

Note
To create a new connection, double click the free field in the first column.
Change the connection parameters of the newly created connection.

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9. Display and operating objects

Display and operating objects are graphic elements used to design process screens.
All display and operating objects behave dynamically in Runtime.
In addition, you can make the properties of objects dynamic.
An example of this is the graphic of a tank whose fill level changes in the display depending on the corresponding process value.
Another example of the dynamic behavior of an object is a button that triggers a specific function.
Essentially, you can assign dynamic properties to any graphic object.

You have the following configuration options:

- The appearance of the object changes: color and flash behavior.
- The object moves on the screen.
- The object is shown or hidden.

The following additional options are available for operator controls:

- An object is enabled or locked for operating.
- Operator input, such as clicking an object, triggers an event. The configured response to this event is to work through a function list.

9.1 Layers

Layers and nesting of objects within levels are used for the differential display and editing of screen objects.

A screen has 32 layers. Objects can be inserted at every layer. The assignment of an object to a layer determines the nesting of an object in the screen. Objects of layer 0 are located in the screen background, while objects of layer 31 are located in the foreground.
The objects are also staggered within each layer.

In the creation of a process screen, the objects of an individual layer are arranged by default in the order of their configuration. The first object inserted is located at the very rear of the layer. Each further object is placed one position further to the front.
It is possible to change the position of objects to each other within the layer.
There is always one active layer. When you add new objects to a screen, these are assigned to the active layer as standard. The number of the active layer is indicated in the "Layer" toolbar. The active layer is highlighted in color in the layer pane.

When you open a screen, all 32 layers of the screen are always displayed.
You can use the layer pane after opening the screen to hide all layers except the active layer. You then explicitly edit objects of the active layer.

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9.2 Basic objects

Symbol	Object	Notes
	"Line"	You can choose straight, rounded or arrow-shaped line ends
	"Polyline"	A "polyline" consists of linked paths and may have any number of vertices. The vertices are numbered in the order of their creation. You can modify or delete vertices individually. You can choose straight, rounded or arrow-shaped line ends for the polyline. The polyline is an open object. Even if the start and end points have the same coordinates, the area they enclose cannot be filled in.
	"Polygon"	The vertices of a polygon are numbered in the order of their creation. You can modify or delete vertices individually. You can fill a polygon with a color or a pattern.
	"Ellipsis"	You can fill an ellipsis with a color or a pattern.
	"Circle"	You can fill a circle with a color or a pattern.
	"Rectangle“	You can set any rounding for the vertices of a rectangle. You can fill a rectangle with a color or a pattern.
	"Text field"	In a text field, you display one row or multiple rows of text and assign font colors and fonts to this text. You can fill a text field with a color or a pattern.
	"I/O field"	An I/O field can be assigned the following functions in Runtime: • Output of tag values • Input of values by the operator; the input values are stored in a tag • Combined input and output; in this case, the operator can edit the output tag values and thus reset them. You can define limits for the tag values shown in the I/O field. If you want to hide the operator input in Runtime, configure "Hidden input".
	"Date/time field"	A date/time field may have the following functions in Runtime: • Output of the date and time • Combined input and output; in this case, the operator can edit the output values and thus reset the date or time. The system time or corresponding tags can be used as the source for the date and time. You can choose to have the date displayed in detail (e.g. Tuesday, December 31, 2003) or in short form (12/31/2003).

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Symbol	Object	Notes
	“Graphic I/O field”	A graphic I/O field can be assigned the following functions in Runtime: • Output of entries of a graphic list • Combined input and output; in this case, the user can select a graphic from the graphic list and thus change the content of the graphic I/O field. Example of its use as output field: To indicate the status of a valve in Runtime, the graphic I/O field outputs the image of a closed or open valve.
	"Symbolic I/O field"	A symbolic I/O field can be assigned the following functions in Runtime: • Output of text list entries • Combined input and output; in this case, the user can select a text from the text list and thus change the content of the symbolic I/O field. Example of its use as combined input and output field: To control a motor in Runtime, the user selects the "Motor OFF" or "Motor ON" text from the text list. The motor is started or stopped depending on the selection; the symbolic I/O field shows the respective state of the motor (motor OFF/Motor ON).
	"Graphic view"	The graphic view is used to show graphics created with third-party graphic programs in a screen. The follow graphic formats can be displayed: "*.emf", "*.wmt", "'.dib", "'.bmp", "*.jpg", "'.jpeg", "'.gif' and "*.tif“. You can use the graphic view to insert graphics of other graphic programs and OLE (Object Linking and Embedding) objects. OLE objects can be opened and edited directly from the properties window of the graphic view in the graphics program in which they were created.
	"Button"	The operator uses the button to control a process. Functions and scripts can be configured on the button.
	"Switch"	In Runtime, the switch is used to input and display two states, such as ON and OFF, or pressed and not pressed. The switch can be labeled with text or graphics to display the state of the switch in Runtime.
	"Bar"	A value from the controller is displayed in Runtime in the form of a bar in a scaled graph. You can use a bar to display changes in fill level, for example.

Note
Depending on the HMI device which you are configuring, some of the objects from the Tools window are available either with restricted functionality or not at all.
Objects that are not available in the Tools window are grayed out and cannot be selected.

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9.3 Enhanced objects

Symbol	Object	Description
	"Slider"	The operator can use the slider to read and input numerical values as follows. • As indicating element, the position of the slider shows the current value from the controller • To input widths, the operator moves the slider to the required position. The slider can only be configured with vertical sliding direction.
	"Clock"	In Runtime, the clock is used to display the system time in either analog or digital format on the HMI device.
	"Status/Force"	Status/Force gives the operator direct read and write access from the HMI device to individual address areas in the connected SIMATIC S7 or SIMATIC S5.
	"Sm@rtClient view"	The operator can use Sm@rtClient view to monitor and operate another HMI device of the plant.
	"HTML browser"	The operator can use the HTML browser to view websites.
	"User view"	In WinCC flexible, you can protect the operation of screen objects using passwords. In Runtime, the user view allows an administrator to manage the users on the HMI device. Users that do not have administrator rights can change their passwords in Runtime.
	"Pointer instrument"	In Runtime, you can use the pointer instrument to display numerical values using a pointer position. It is possible to configure the appearance of the pointer instrument. You can, for example, change the background graphic or the scale design.
	"Trend view"	You can use the trend view to simultaneously display multiple trends with values from the controller or from a log. The axes of the trend view can be configured (scales, units etc.).
	"Recipe view"	The operator can use the recipe view to display, edit and manage data records in Runtime.
	"Alarm view"	The operator can use the alarm view to display selected alarms or alarm events from the alarm buffer or alarm log in Runtime.
	"Alarm window"	The operator can use the alarm window to display selected alarms or alarm events from the alarm buffer or alarm log in Runtime. You can only configure the alarm window in the template.
	"Alarm indicator"	The alarm indicator signals to the operator that alarms that need to be acknowledged have arrived and have not yet been acknowledged. You can only configure the alarm indicator in the template.

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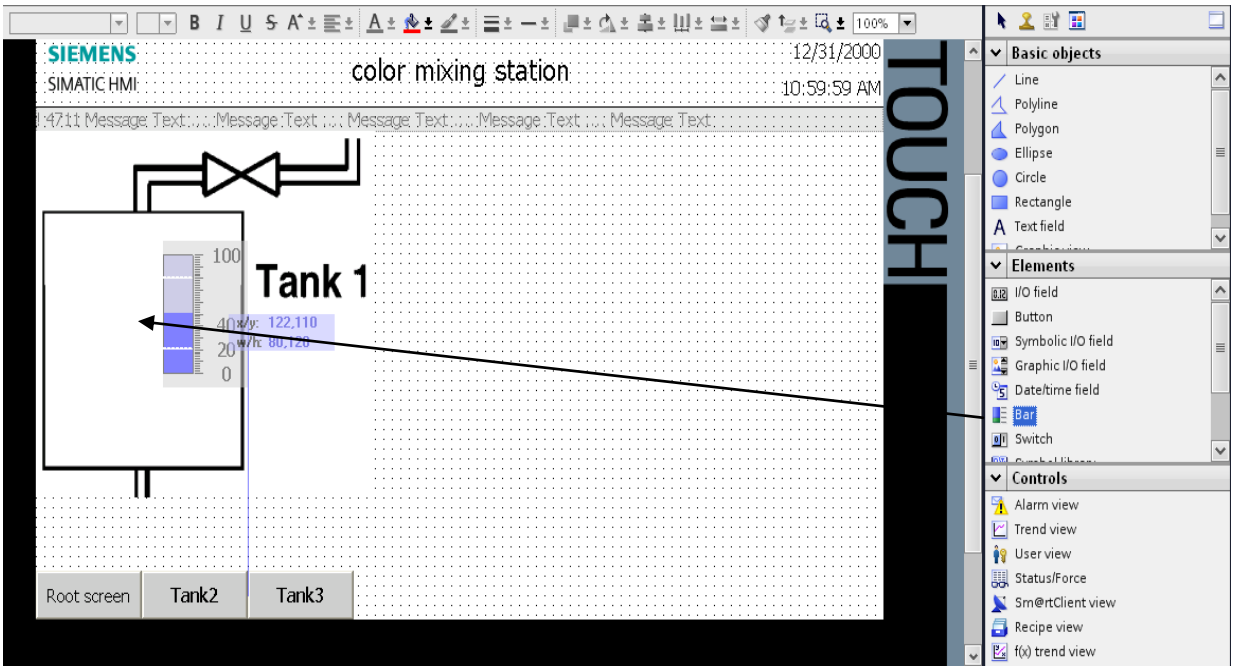
10. Display and operating objects in the "Color mixing station" project

10.1. Configuring display and operating objects in the “Tank 1” screen

A bar, two sliders and two buttons are configured to begin with.
Afterwards, the supply and drain valves are to be animated in color.

Configuring the bar view

You are going to configure a bar to display the current fill level of Tank 1.
Drag a bar to the Tank 1 screen.



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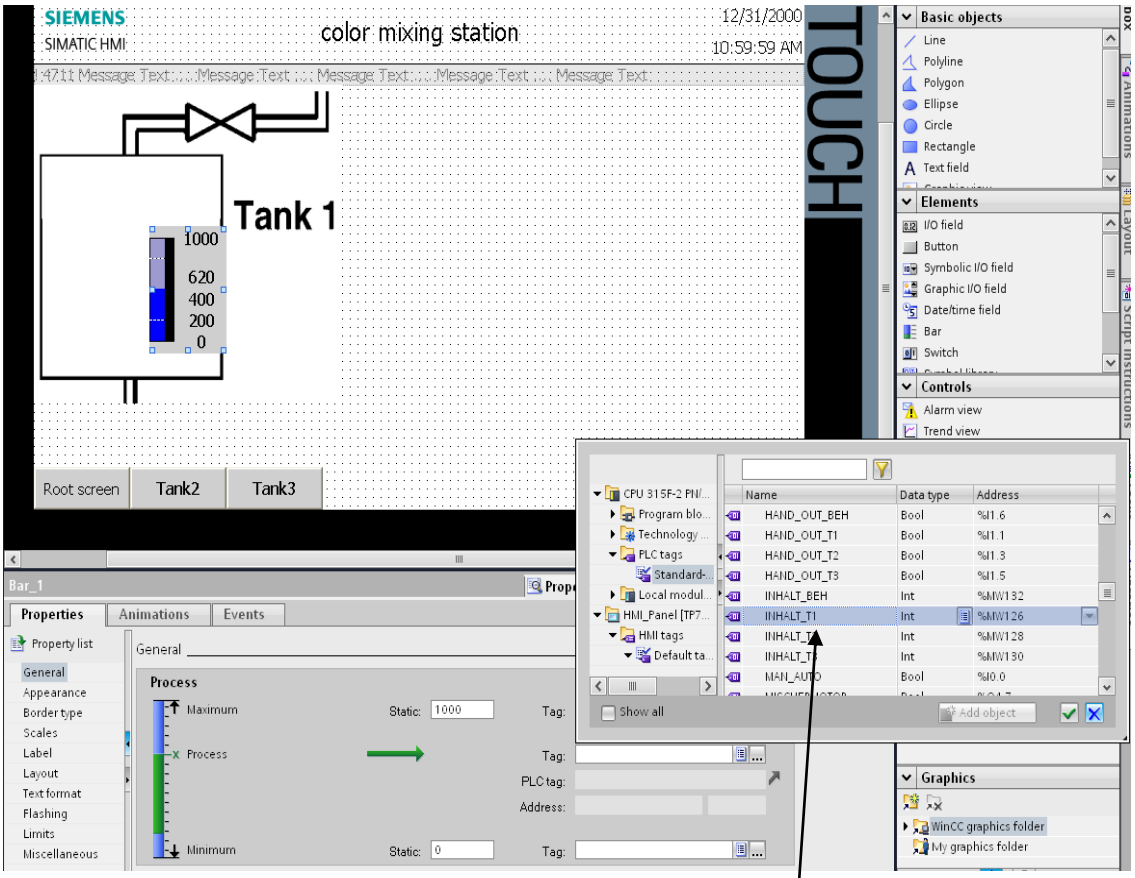
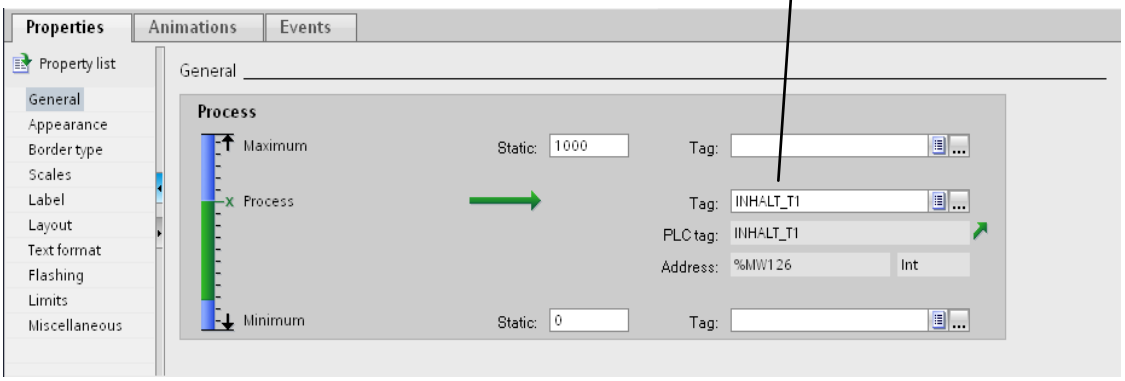
Specify **1000** as the maximum value.

Select the tag "**CONTENT_T1**" as process tag from the PLC tags of the color mixing station.



The WinCC tag "**CONTENT_T1**" was automatically generated.



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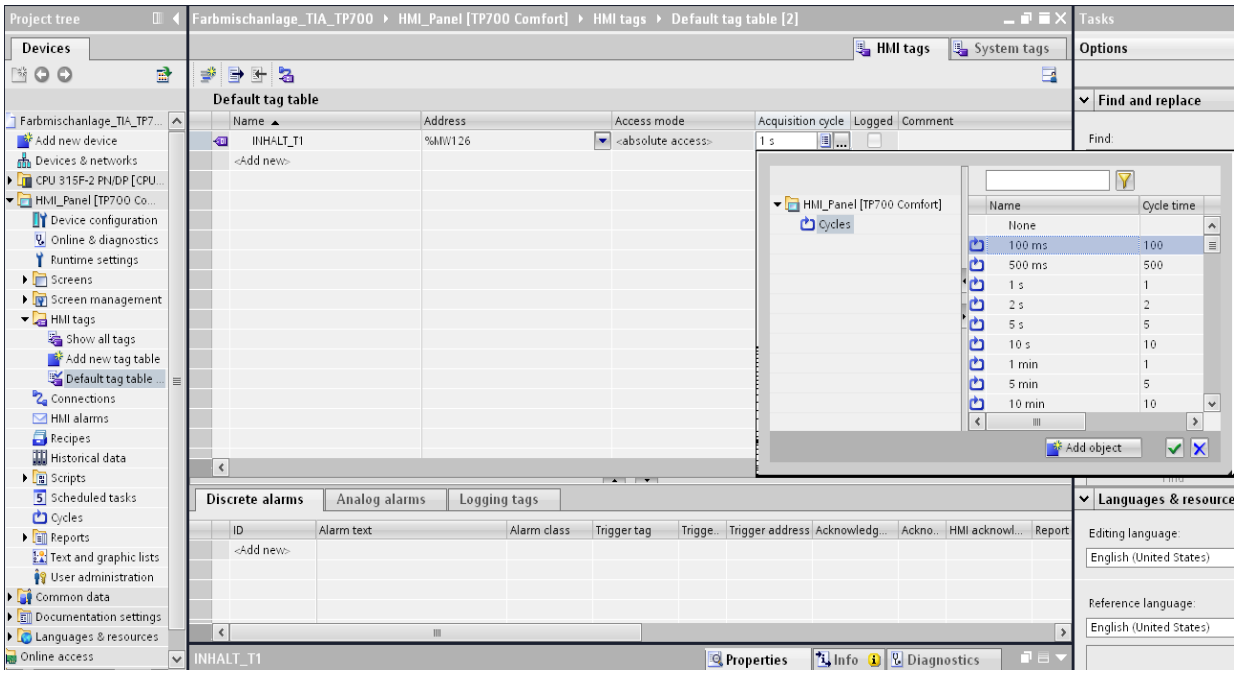
To make additional settings, double-click **Default tag table** in the project window.



Set the acquisition cycle of the tag to **100 ms**. The tag is now updated every 100 ms. The movement of the bar, i.e. the fill level of the tank, is now animated in the display.

Note
The communication influences the cycle time of the SIMATIC S7 300 controller. When there are a large number of tags, it is advisable to consider precisely the acquisition cycle of each tag.

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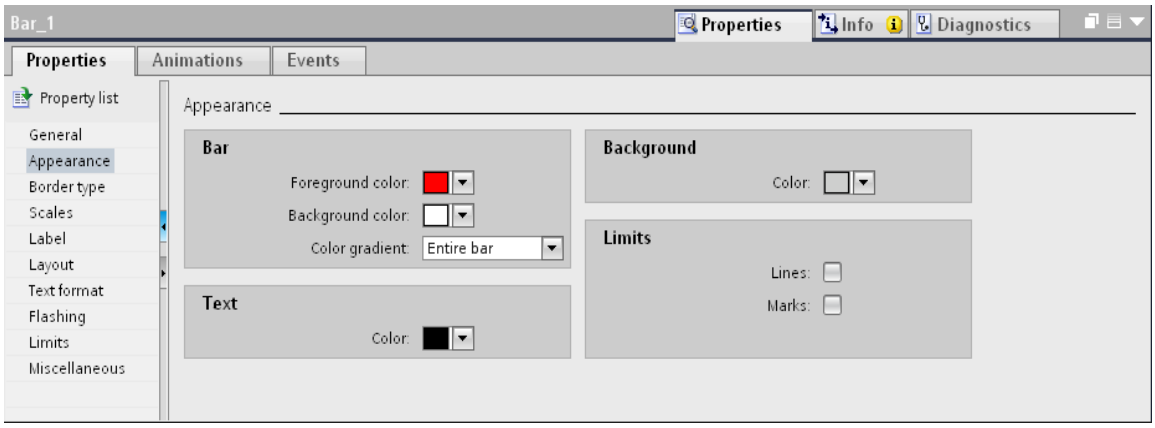
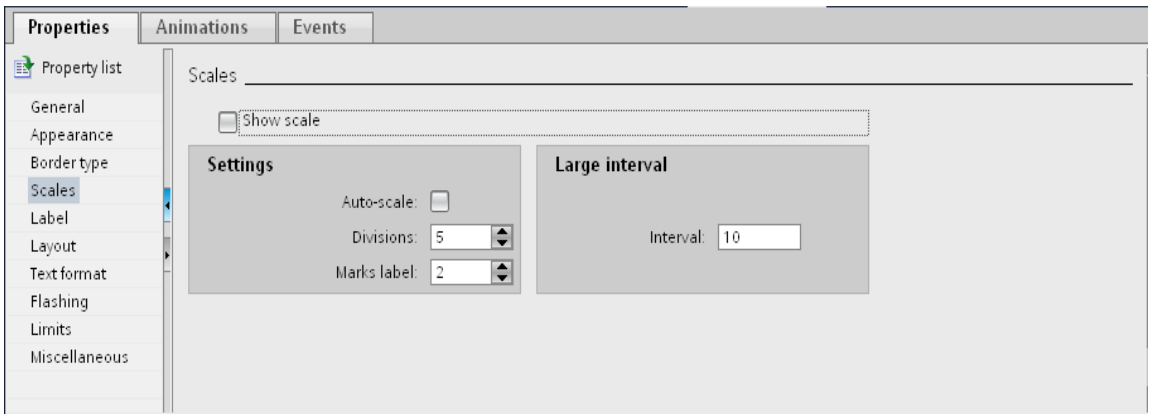
In the Properties window under **Appearance,** change the color assignments of the foreground color to **Red** and the bar background to **White**.
Under Limits, remove the check mark for “**Lines**”.



Under Scales, remove the check mark for “**Show scale**”.



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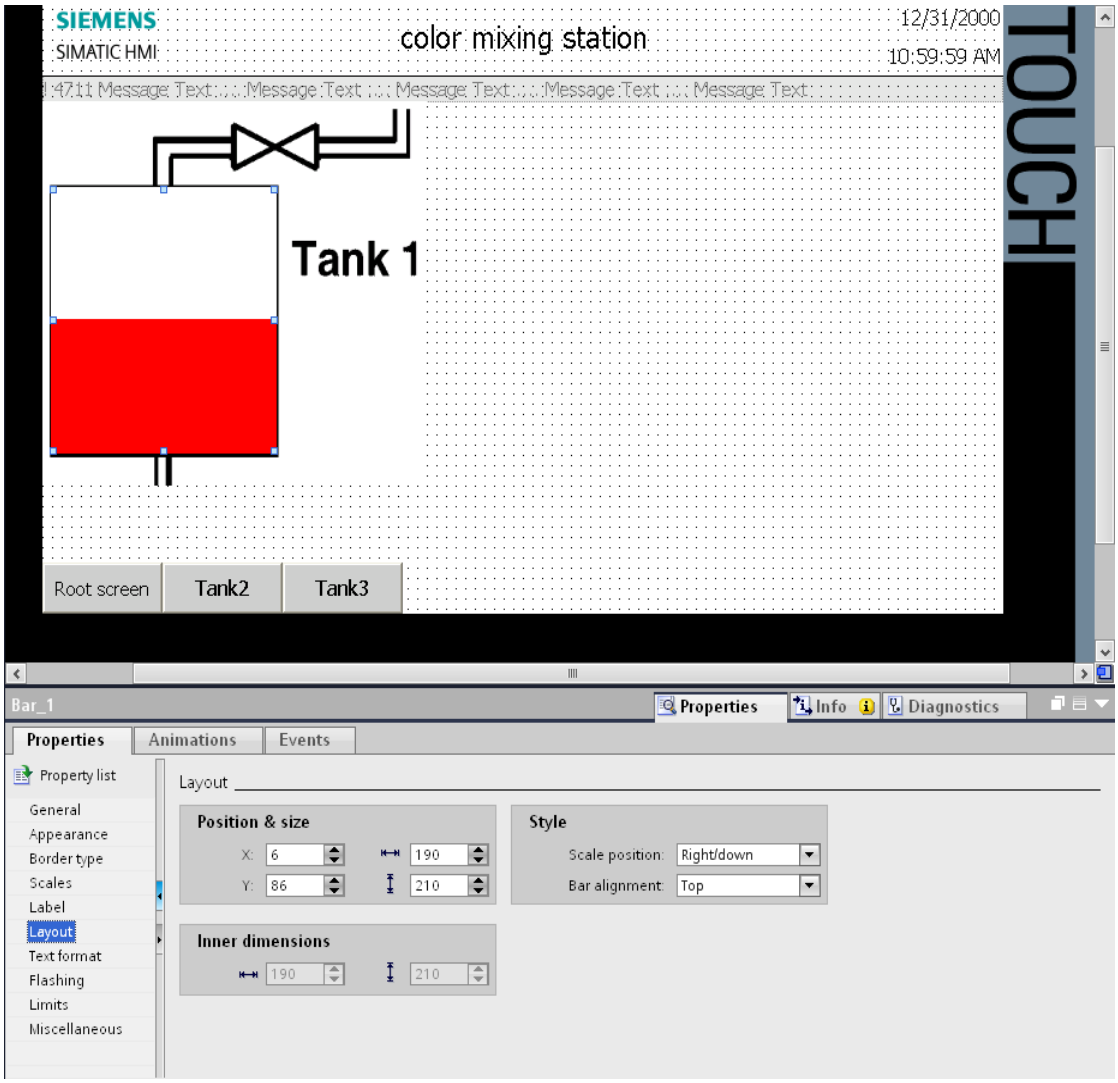
Under Layout, change the position and bar size.

The bar alignment is set by default to **Top**.



The bar to display the fill level in the Tank 1 screen is now complete.

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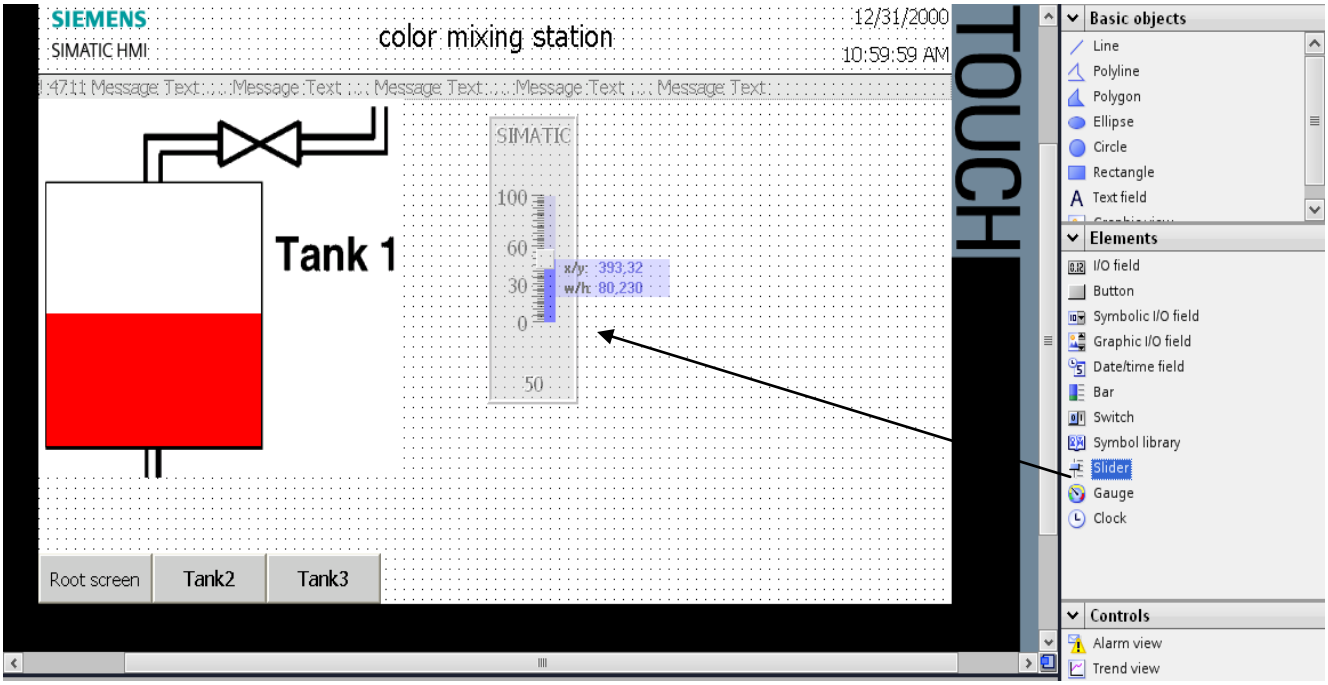
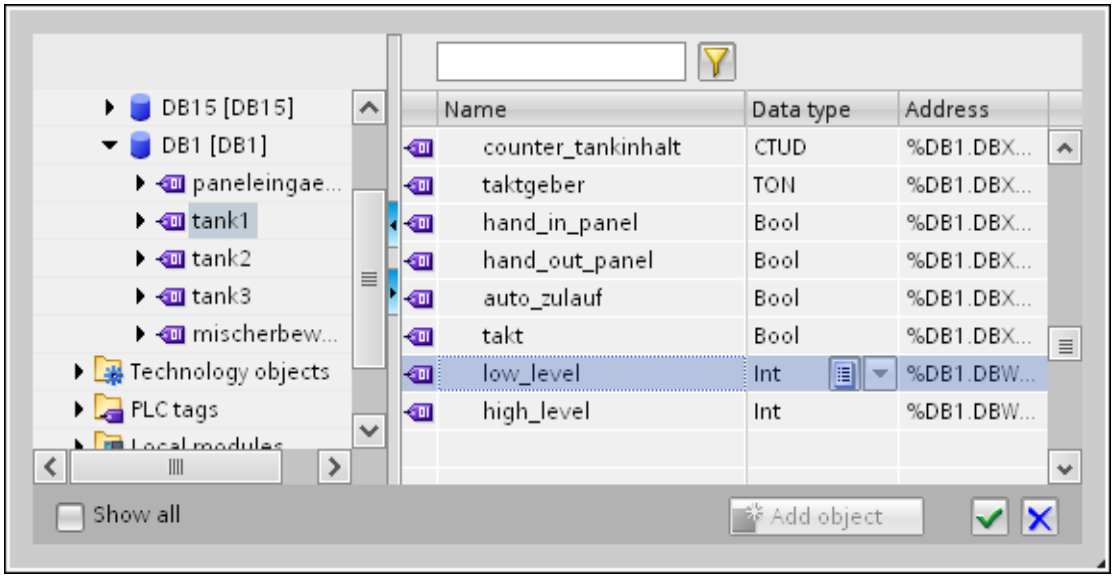
Configuring sliders

A slider is configured to set the minimum fill level.

From the Tools window, under **Enhanced objects**, drag the **slider** to the "Tank 1“ screen.



Enter **450** as maximum value and **10** as minimum value, and select the tag " **low_level**" as process tag from the FB call "**tank1**" of the **DB1** of the color mixing station.



Note
In WinCC, you can also access the tag declaration in a data block.

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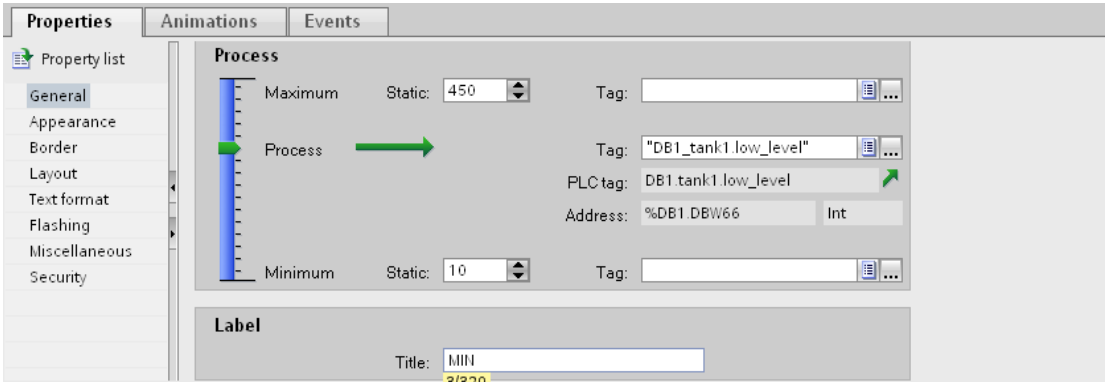
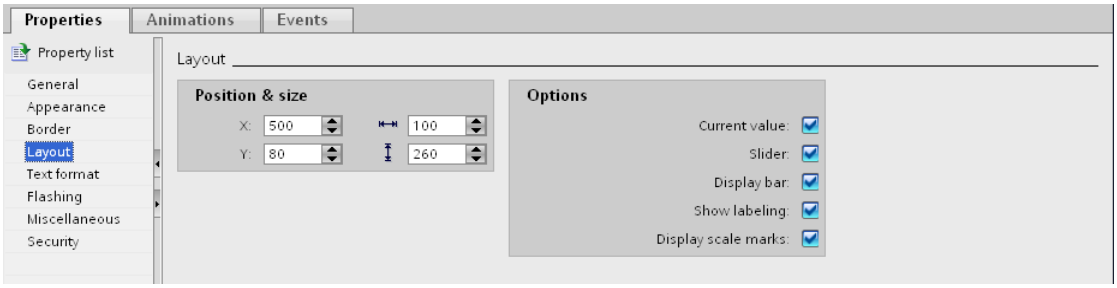
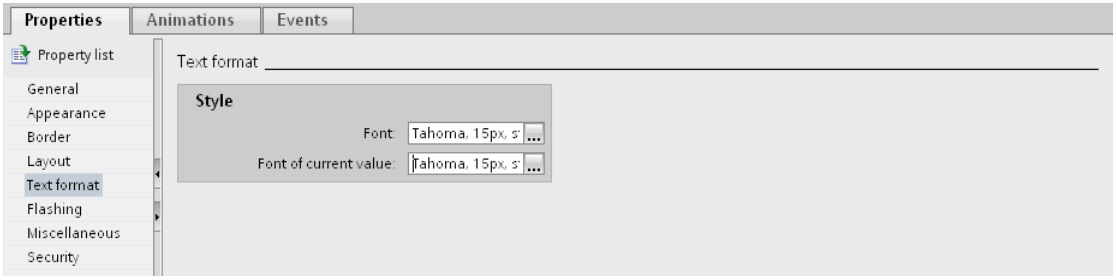
Under General, enter “**MIN**” as the title.



Under Layout, change the position and size of the slider.



Under Text format, change the font size to Tahoma, 15px **bold**.



Insert a second slider to set the maximum fill level in Tank 1.
Change the minimum value to **550** and the maximum value to **990**, and select the tag “**high_level**” as process tag from the FB call “**tank1**” of the **DB1**.
Under Layout, enter “**MAX**” as the title.
Position the slider to **X600** and **Y80** and change the size to **100** x **260**.
Under Text format, change the font size.

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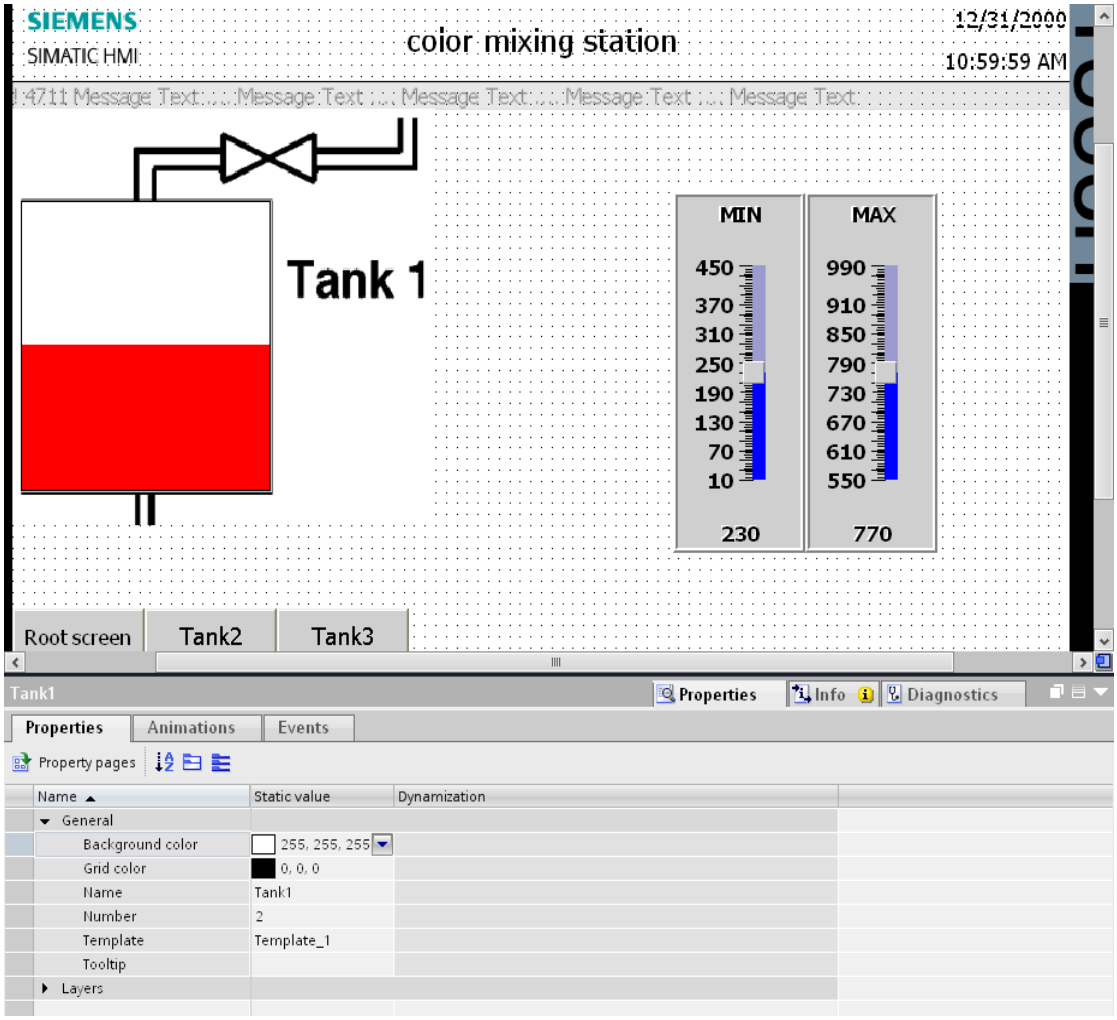
The Tank 1 screen now looks like this.



Three tags have now been created automatically.

Set the acquisition cycle of the newly created tags to 100 ms.

Default tag table

Name	Address	Access mode	Acquisition cycle
INHALT_T1	%MW126	<absolute access>	100 ms
DB1_tank1.low_level	%DB1.DBW66	<absolute access>	100 ms
DB1_tank1.high_level	%DB1.DBW68	<absolute access>	100 ms

Remember to save the project!

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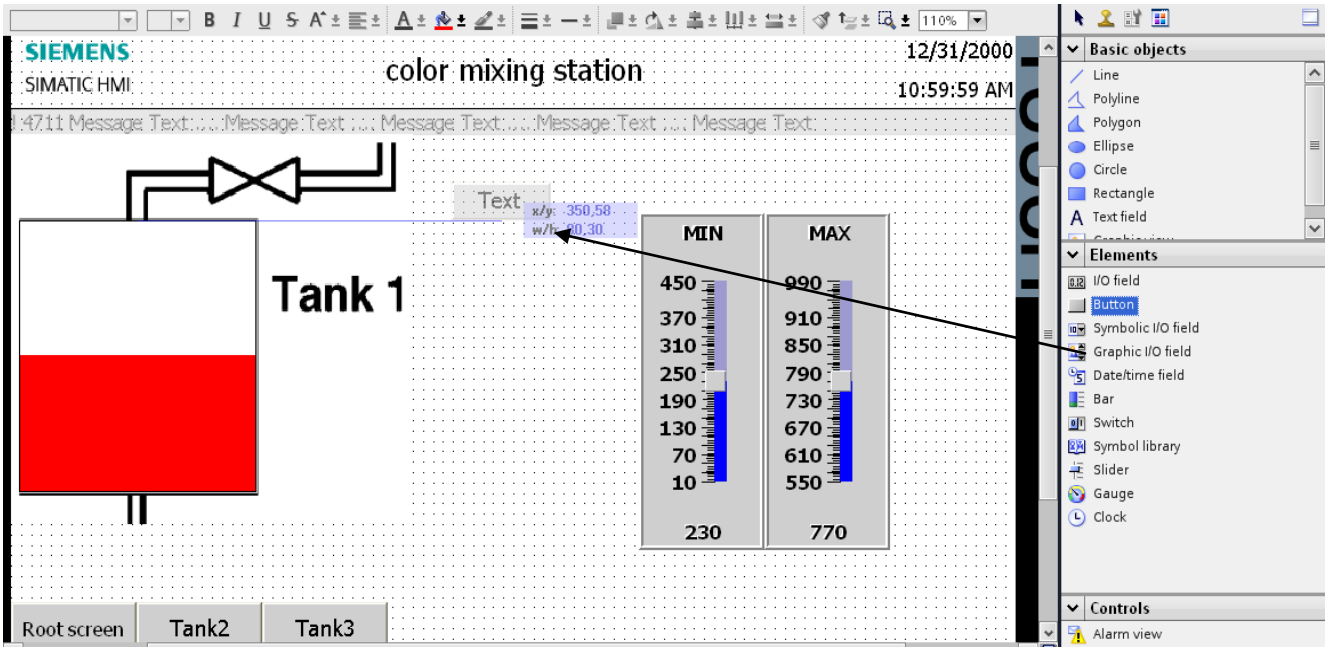
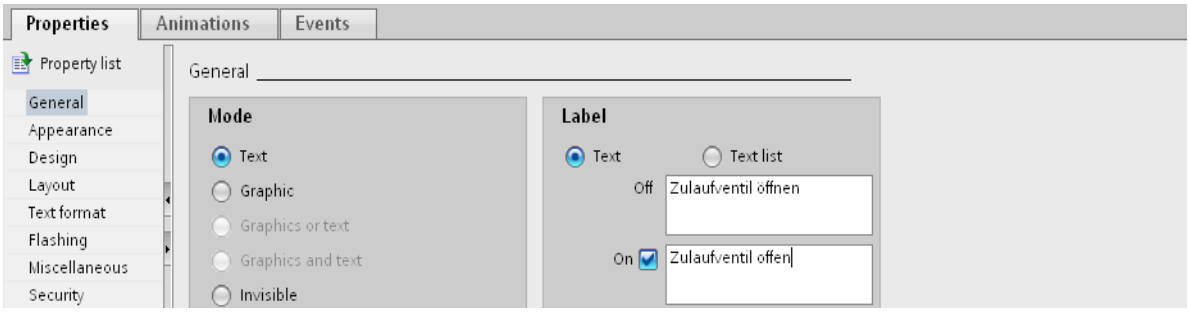
Configuring buttons

We configure a button for opening the valves.
From the Tools window, under **Basic objects**, drag a **button** to the “Tank 1” screen.



Under General, select the **Text On** check box and enter the text.

Caution! Do not press the Enter key after entering the text; otherwise, a new line will be created.



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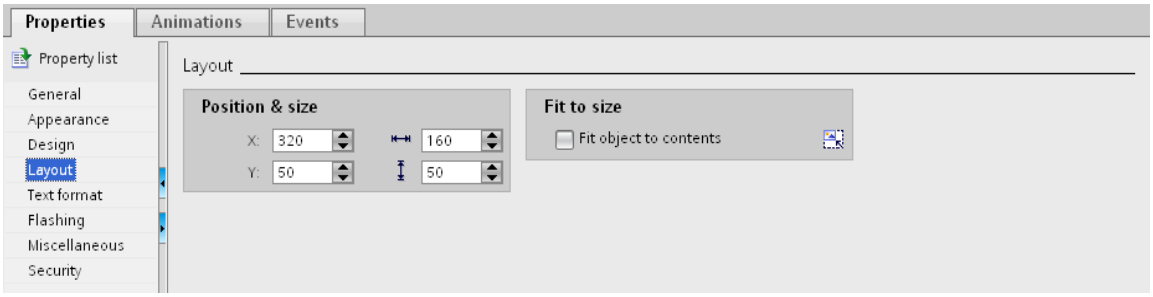
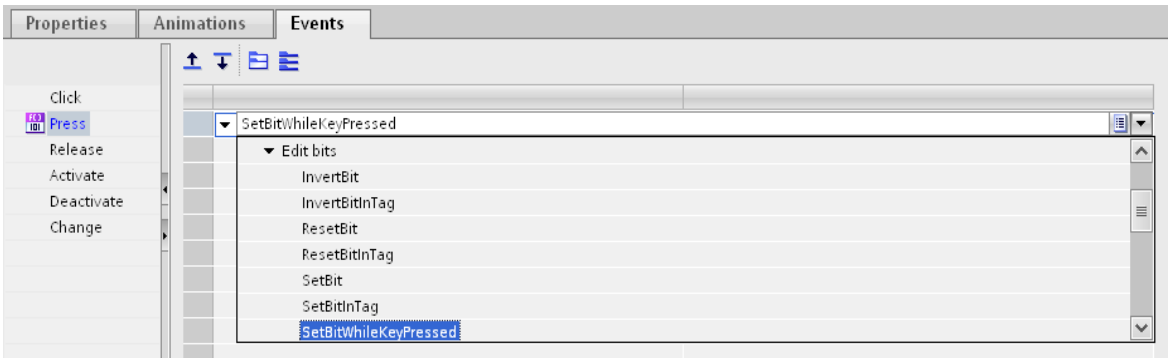
Change the background color to **White** and select a font size.

Set the position and the size.

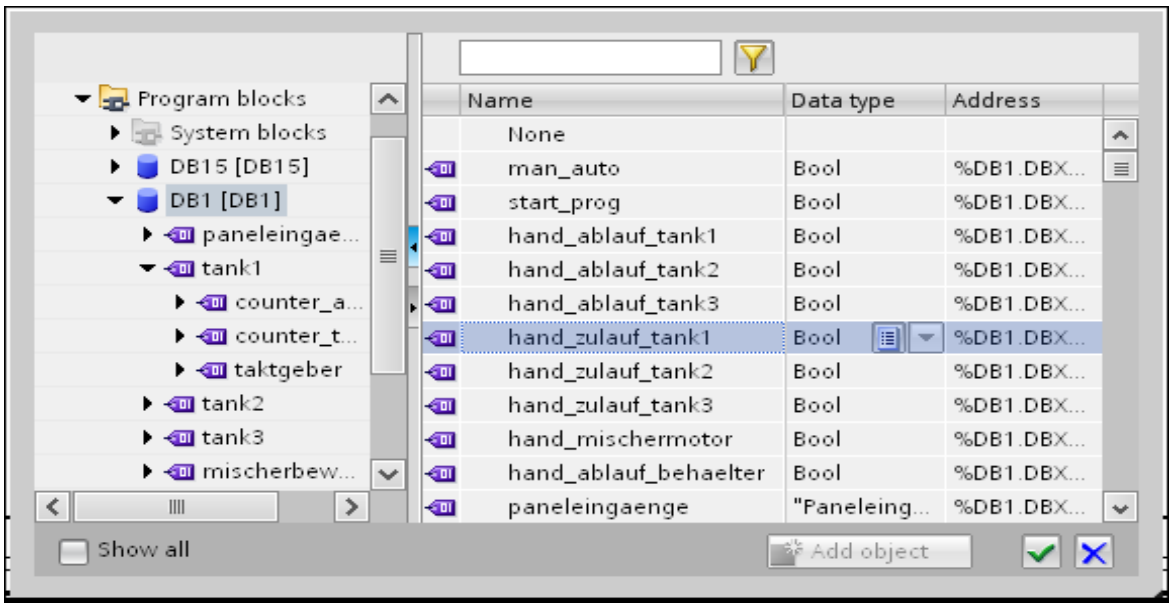


Open the Events tab.

Under Press, select the function "**SetBitWhileKeyPressed**" in the function list.



Select "**manual_supply_tank1**" as tag from DB1.



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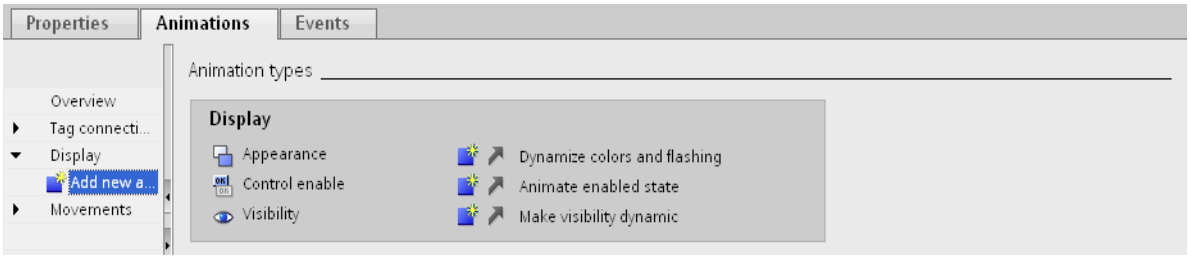
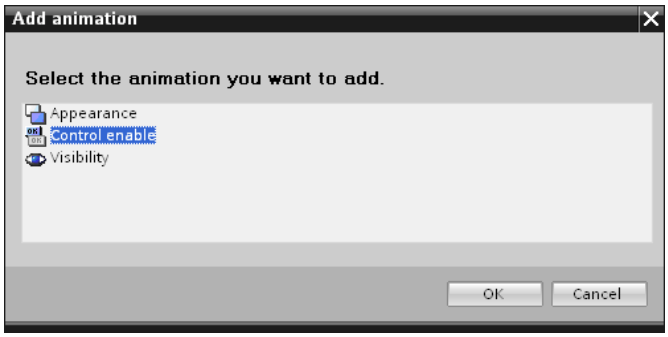
The button should be operable only in manual mode.
In other words, it should only be possible to operate the button if the tag “H3_MAN” has the value 1.

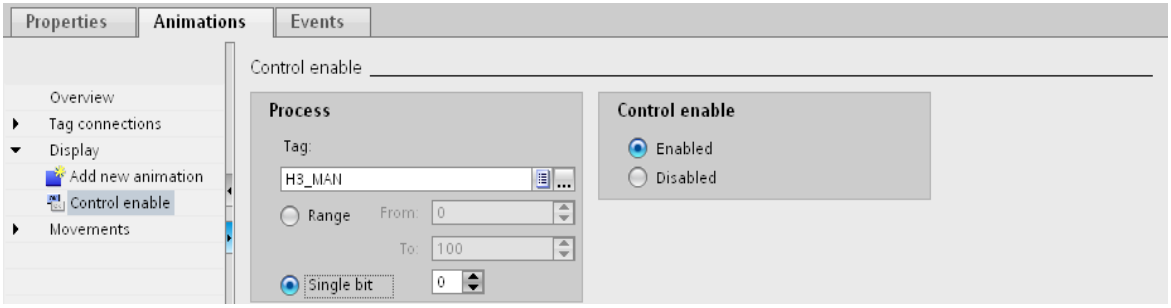
Open the Animation tab.
Under **Display**, select Add new animation.



Under **Animations**, select the **Control enable**.

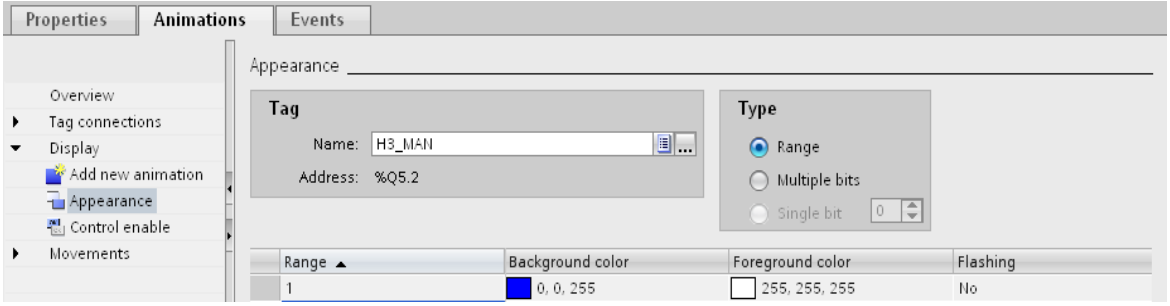


Select "**H3_MAN**" as tag from the PLC tags.
Under Control enable, set the status to **Enabled**.
For **Single bit**, select the **bit position 0**.



Create a new animation appearance.

The button should change color in manual mode; i.e. when the tag “H3_MAN” has the value 1. To make the color change visible, change the foreground color to **white** and the background color to **blue** under Appearance.



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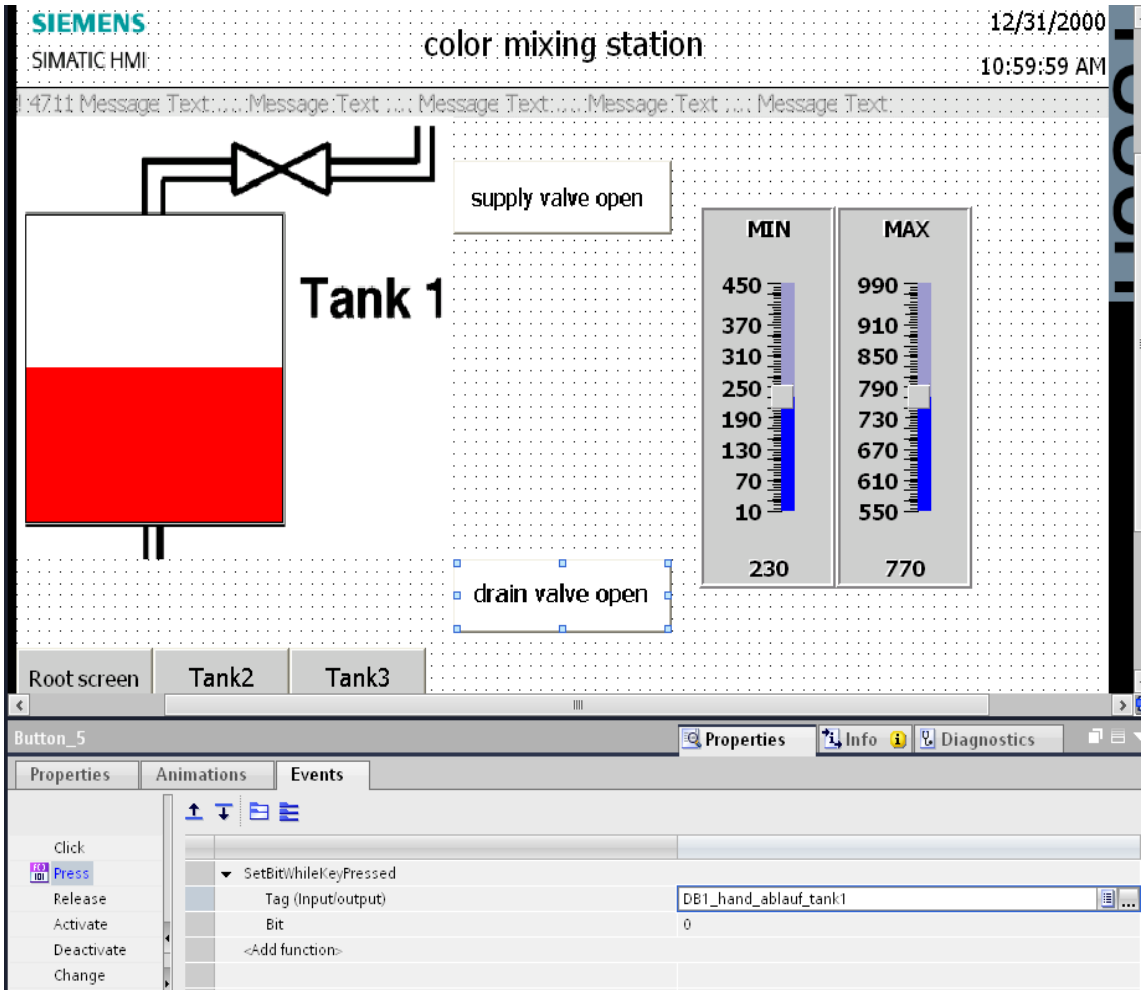
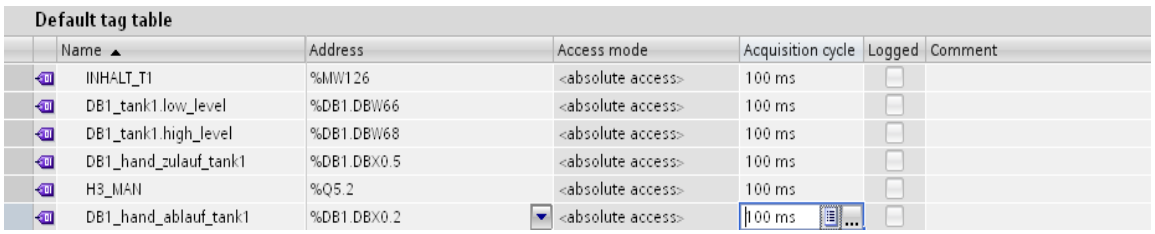
Copy and insert the button.

Change the text to “**Drain valve**”, and the position to **X320**, **Y320**.

Under **Press** Events, select the tag “**manual_drain_tank1**”.



The tag list now contains three more tags that have been automatically created.



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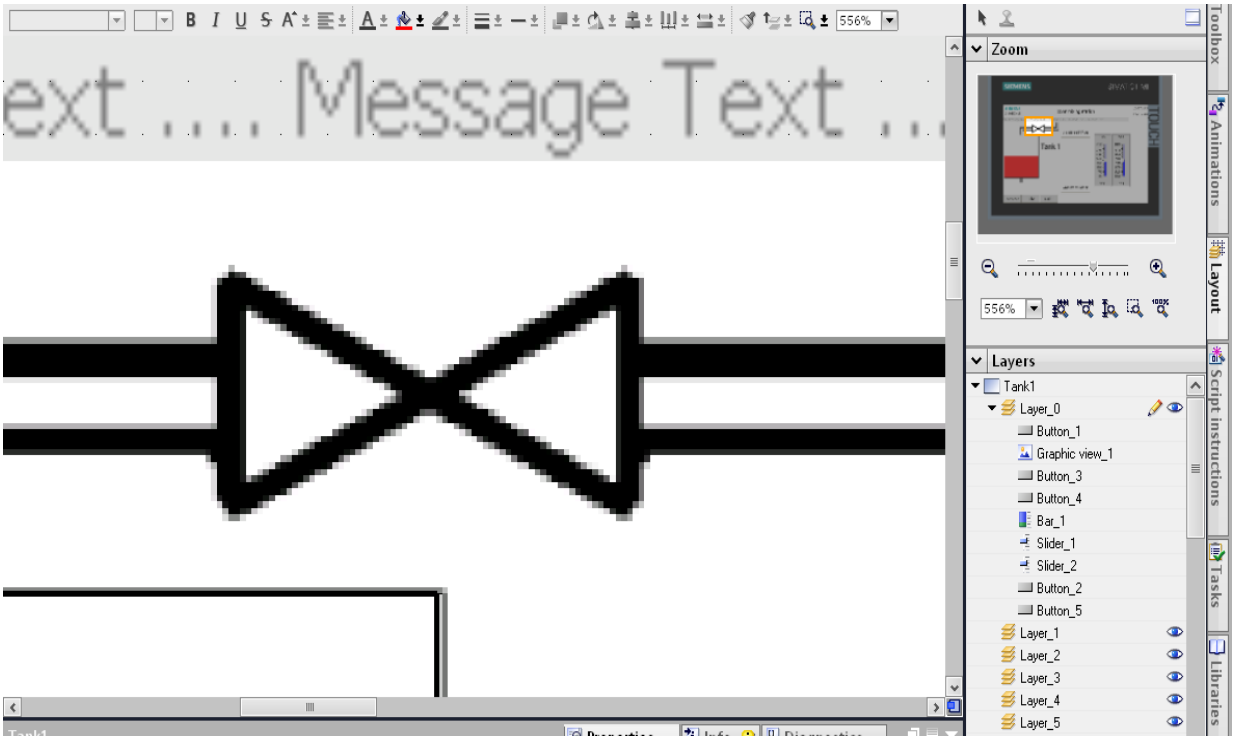
Displaying the valve function in color

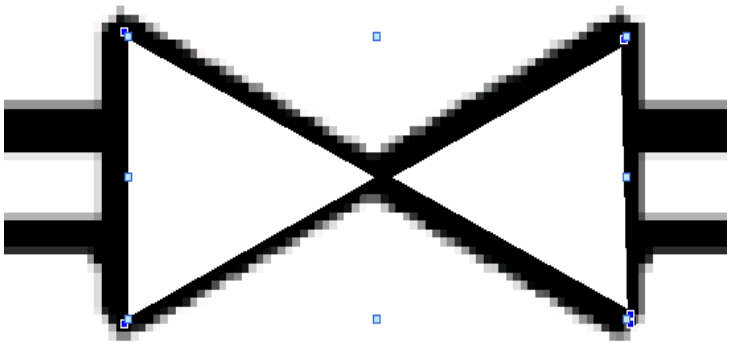
The switching states of the valves should be visible through a color change.

Click the Layout tab. First, enlarge the zoom factor of the view and select the screen section of the valve.

Then, go to the Tools tab. Under Basic objects, select the **Polygon**.
Trace the valve by clicking with the mouse on each corner and finish with a double-click.



Due to the grid function, the polygon will be somewhat larger than in the graphic.
The size and position will be adjusted in the properties.



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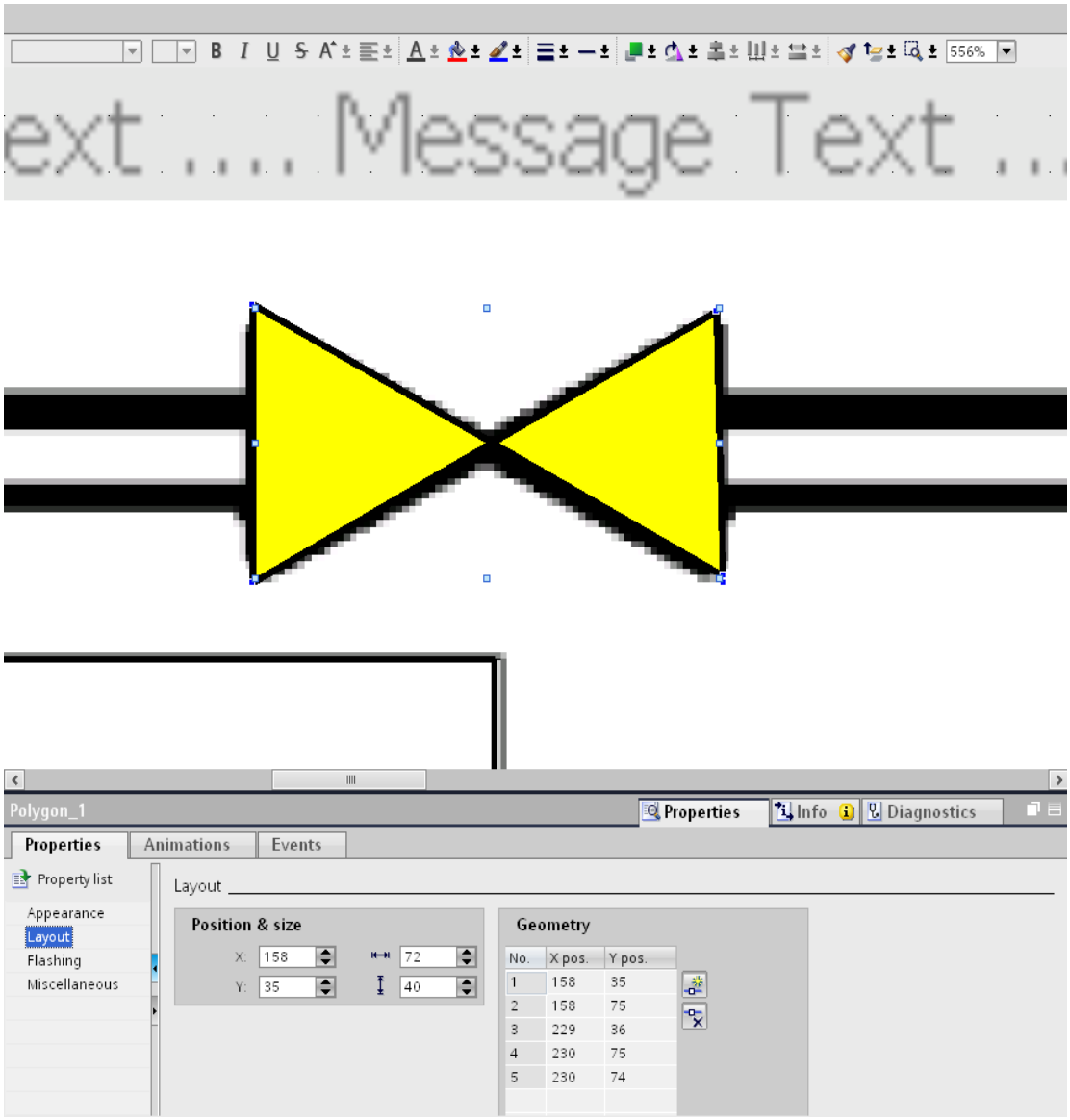
In the Properties, under Appearance, set the fill color to **Yellow**.

Change the position and size so that the graphic and polygon fit together.



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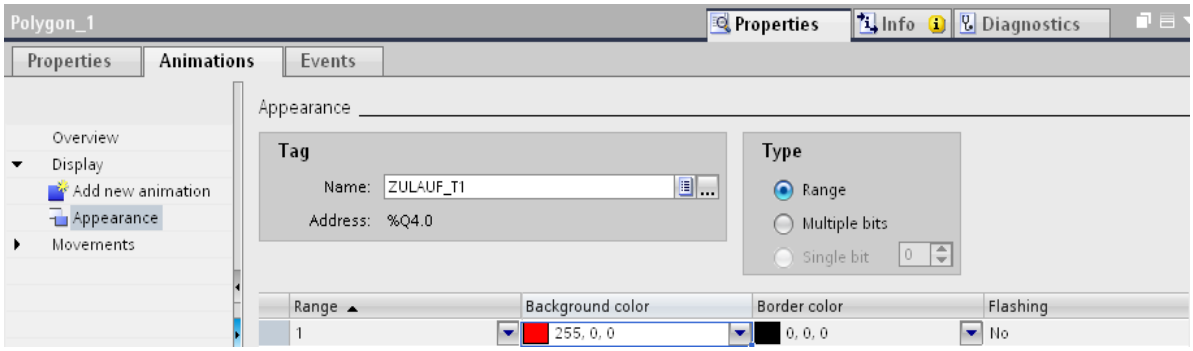
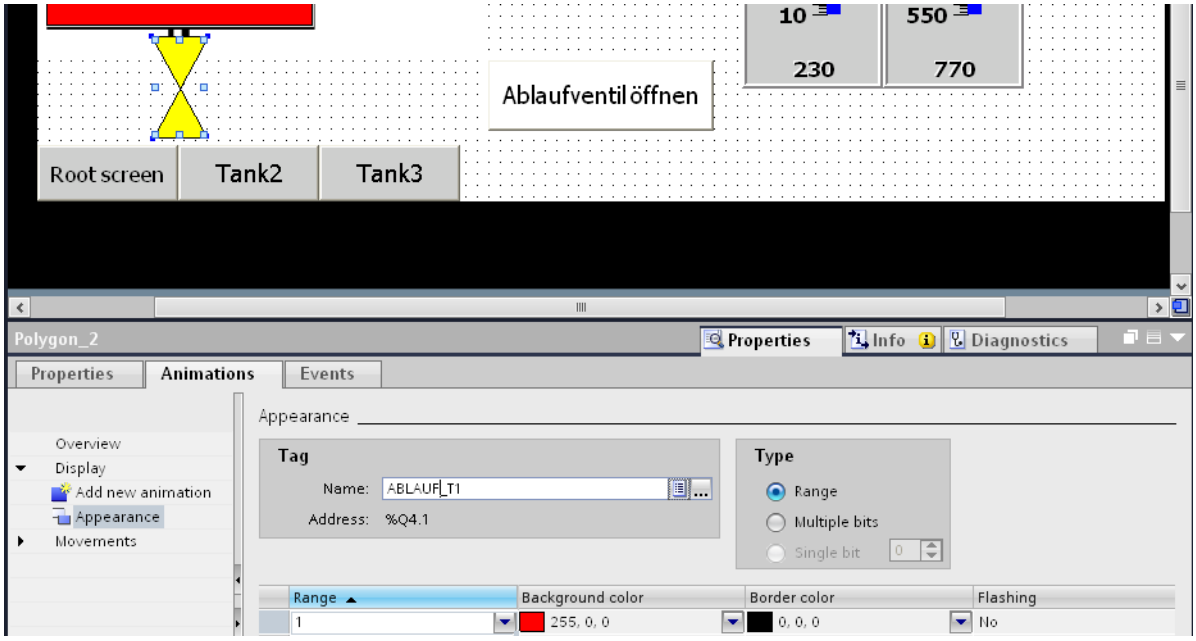
Create a new animation **Appearance** and use the tag **Supply_T1**.

Enter the value **1** as range and change the background color to **red**.



Copy and insert the polygon. Rotate the polygon by 90 degrees and position it below the tank (button for rotating by 90 degrees is in the toolbar at the top).

Use the tag "**DRAIN_T1**" for the color change in the appearance.



The tag list now contains two more tags that have been automatically created.

Default tag table

Name	Address	Access mode	Acquisition cycle
INHALT_T1	%MW126	<absolute access>	100 ms
DB1_tank1.low_level	%DB1.DBW66	<absolute access>	100 ms
DB1_tank1.high_level	%DB1.DBW68	<absolute access>	100 ms
DB1_hand_zulauf_tank1	%DB1.DBX0.5	<absolute access>	100 ms
H3_MAN	%Q5.2	<absolute access>	100 ms
DB1_hand_ablauf_tank1	%DB1.DBX0.2	<absolute access>	100 ms
ZULAUF_T1	%Q4.0	<absolute access>	100 ms
ABLAUF_T1	%Q4.1	<absolute access>	100 ms

Remember to save the project!

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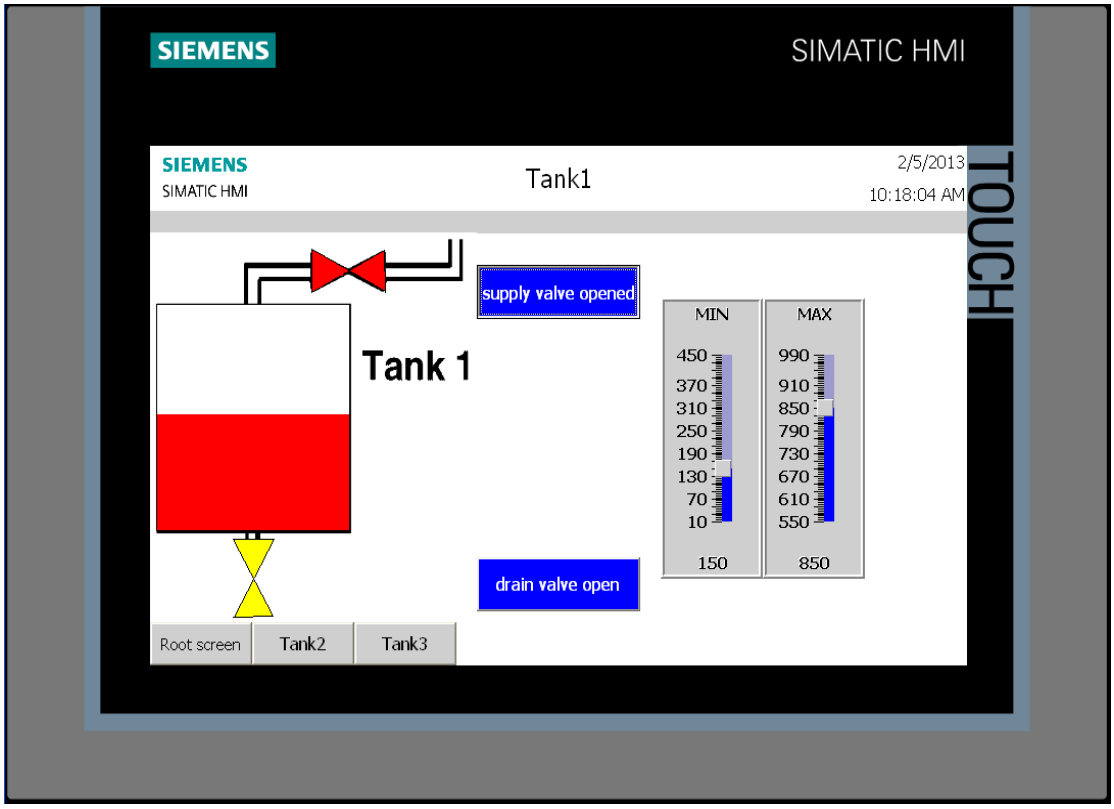
Testing “Tank 1” in Runtime

Load the project to the panel and test the functions in the "Tank 1" screen.



Note

If the reservoir is filled, the drain valve cannot be opened.

You first have to drain the reservoir using the “MANUAL_DRAIN_RES” (I1.6).

If you set the acquisition cycle of all tags to 100 ms, the actuation of the buttons and the valve function will be updated faster.

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10.2 Configuring display and operating objects in the “Tank 2” and “Tank 3” screens

The “Tank 2” and “Tank 3” screens are structured like the “Tank 1” screen.

In the “Tank 2” screen, the fill level of the tank and the valve function are to be displayed in **green** and the tags for Tank 2 will be used, for example “**CONTENT_T2**”.

In the “Tank 3” screen, the fill level of the tank and the valve function are to be displayed in **blue** and the tags for Tank 3 will be used, for example “**CONTENT_T3**”.

Configure the tank screens by either repeating the work steps as for the “Tank 1” screen and using a different color and tag assignment, or copying the objects of the "Tank 1" screen and inserting these in the “Tank 2” and “Tank 3” screens.

You can select and copy multiple objects using SHIFT + mouse click.

Afterwards, switch to the "Tank 2" or "Tank 3" screen and insert the objects.

After inserting the objects, you need only change the color assignments and recreate or reassign the tags.

With bars and valves, the size and position also have to be adapted to the background graphic.

Check the created tags and test the objects of the screens in Runtime.

Default tag table

Name	Access mode	Acquisition cycle	Logged	Comment
DB1_hand_ablauf_tank1	<absolute access>	100 ms		
DB1_hand_ablauf_tank2	<absolute access>	100 ms		
DB1_hand_ablauf_tank3	<absolute access>	100 ms		
DB1_hand_zulauf_tank1	<absolute access>	100 ms		
DB1_hand_zulauf_tank2	<absolute access>	100 ms		
DB1_hand_zulauf_tank3	<absolute access>	100 ms		
DB1_tank1.high_level	<absolute access>	100 ms		
DB1_tank1.low_level	<absolute access>	100 ms		
DB1_tank2.high_level	<absolute access>	100 ms		
DB1_tank2.low_level	<absolute access>	100 ms		
DB1_tank3.hand_ablauf	<absolute access>	100 ms		
DB1_tank3.hand_zulauf	<absolute access>	100 ms		
DB1_tank3.high_level	<absolute access>	100 ms		
DB1_tank3.low_level	<absolute access>	100 ms		
DRAIN_T1	<absolute access>	100 ms		
DRAIN_T2	<absolute access>	100 ms		
DRAIN_T3	<absolute access>	100 ms		
H3_MAN	<absolute access>	100 ms		
MAN_AUTO	<absolute access>	100 ms		
SUPPLY_T1	<absolute access>	100 ms		
SUPPLY_T2	<absolute access>	100 ms		
SUPPLY_T3	<absolute access>	100 ms		
VOLUME_T1	<absolute access>	100 ms		
VOLUME_T2	<absolute access>	100 ms		
VOLUME_T3	<absolute access>	100 ms		

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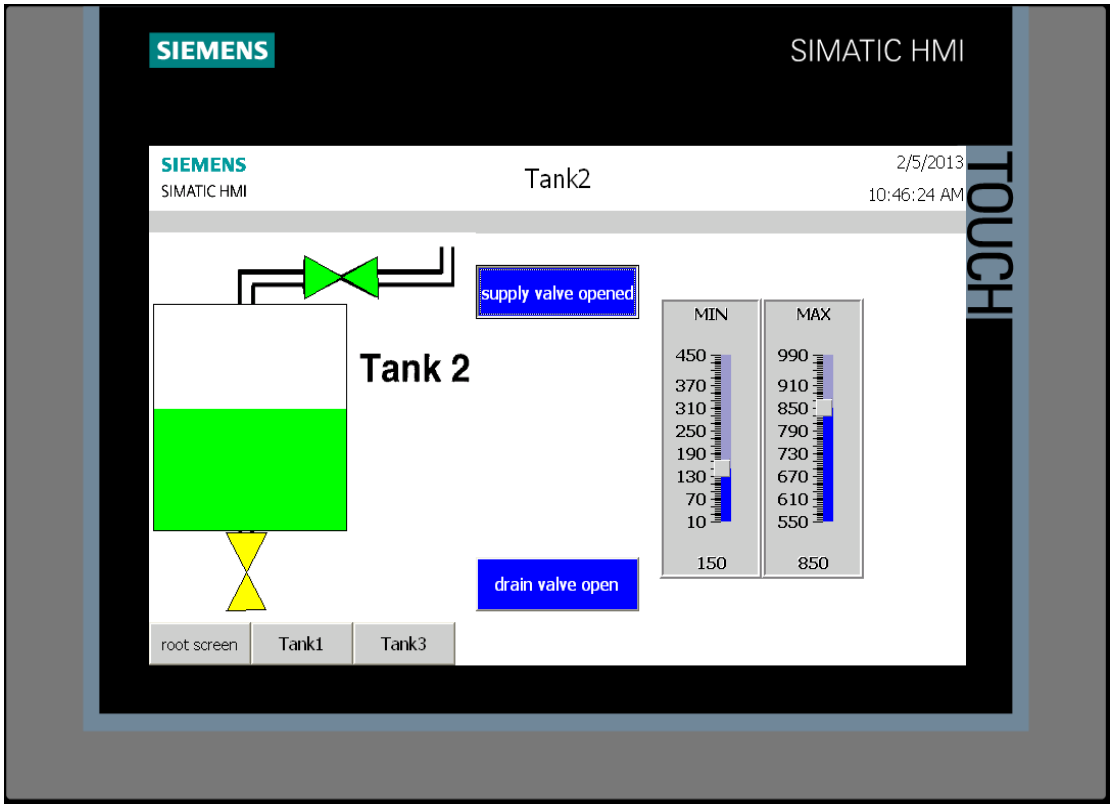
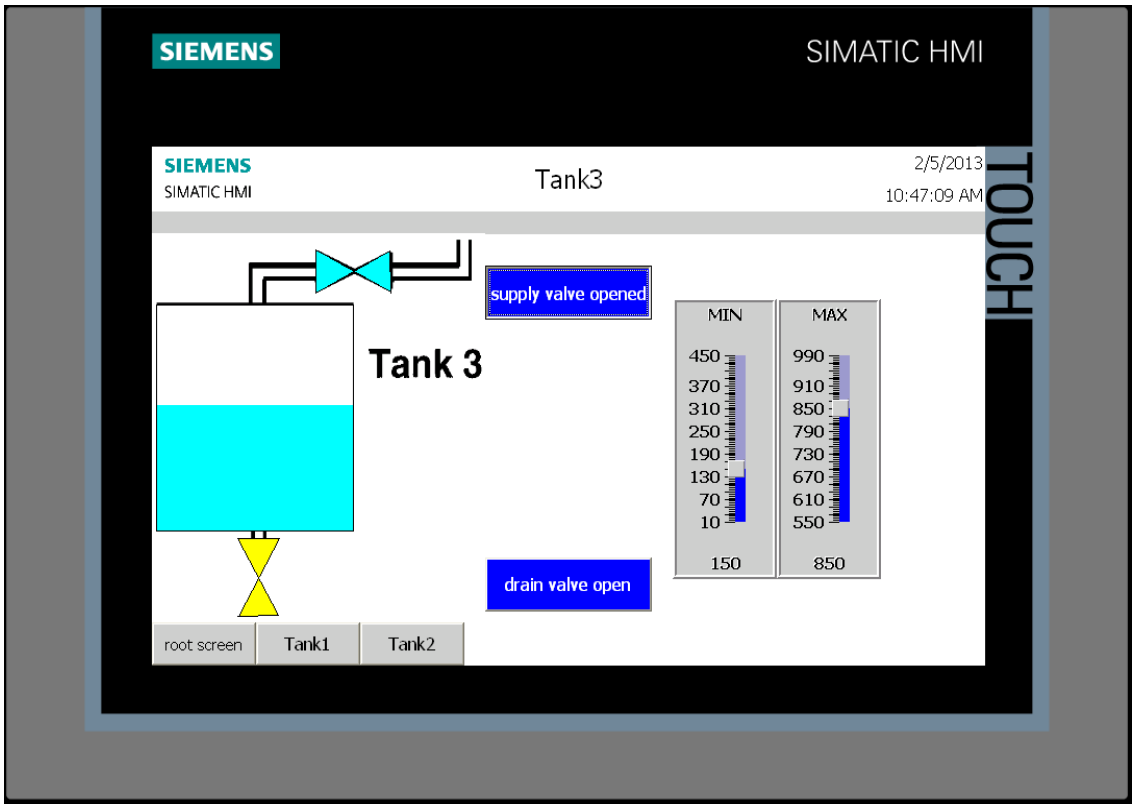
View of “Tank 2” screen



View of “Tank 3” screen



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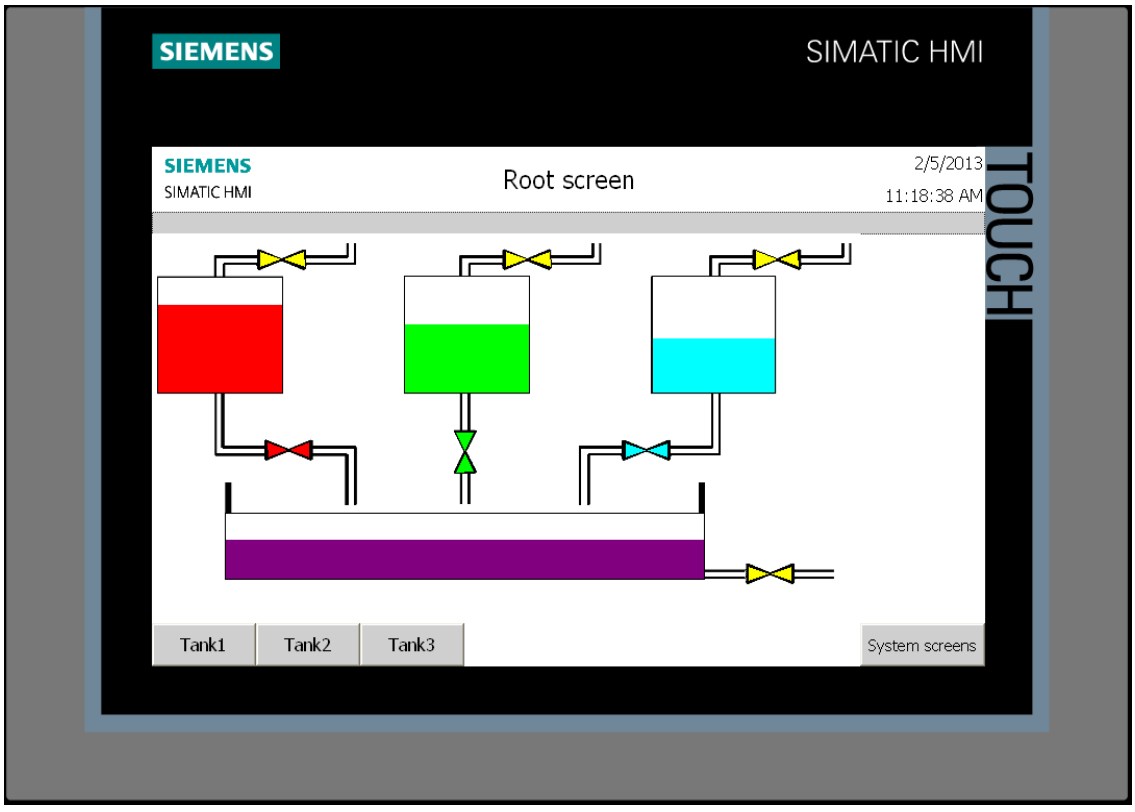
10.3 Objects in the root screen

Fill levels of the tanks and representation of valves

The fill levels and the valve functions of the three tanks are to be shown in the root screen. In addition, the fill level of the reservoir and the function of the drain valve on the reservoir are to be shown in graphic form.

Copy the bars of the tanks and the polygons of the supply and drain valves from the three tank screens to the root screen.
After inserting the objects, you only change their size and position.
Create a new bar for the fill level of the reservoir. Use the tag "**CONTENT_RES**" for the process value and enter **3000** as maximum value.
Use **purple** as the bar fill color (foreground color).
Remove the scale and the limit lines.
Adjust the size and position to the background graphic.
Copy and insert one of the polygons for valve display to the root screen.
Position the polygon above the drain valve of the reservoir and change the color to **purple** in the properties under Animation.
Use the tag "**DRAIN_RES**" as control tag.
Test the root screen in Runtime.



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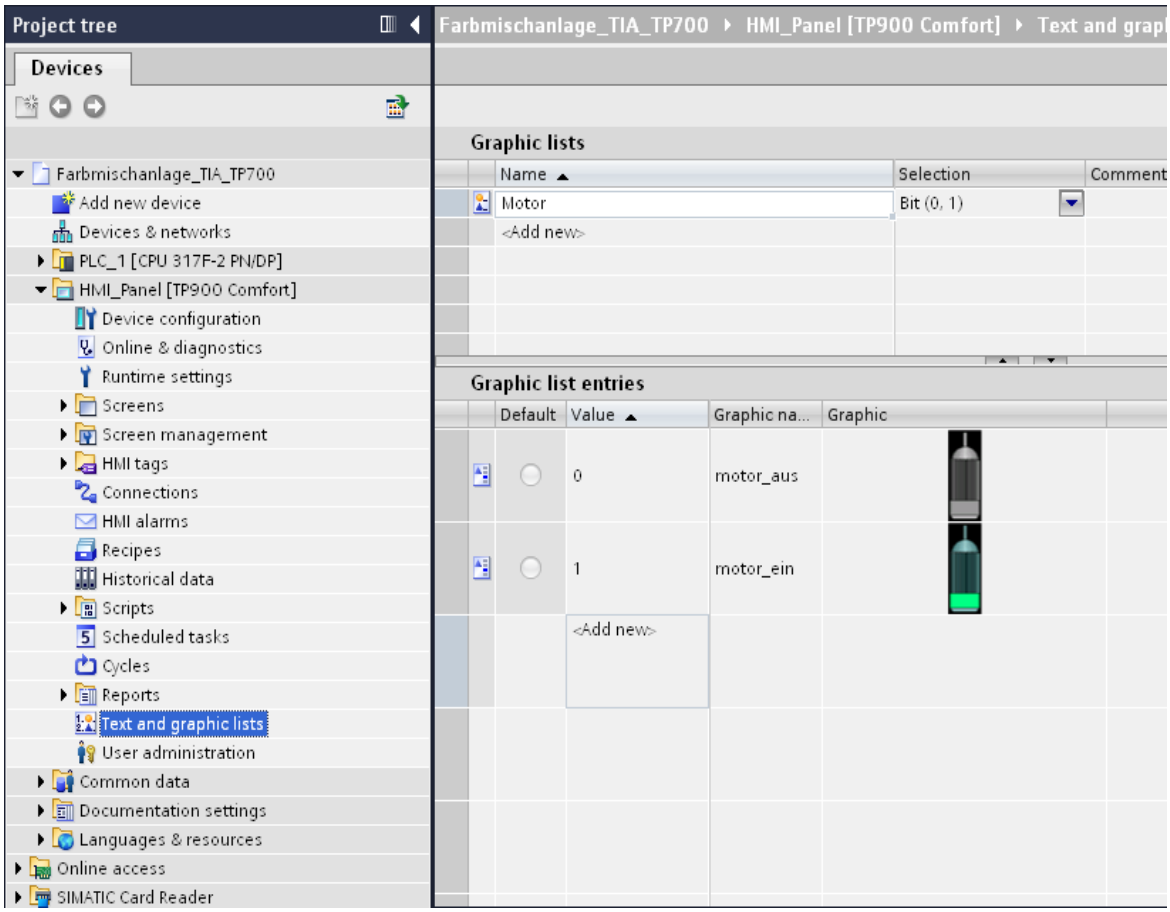
Configuring the mixer motor

A graphic I/O field that is connected to a graphics list is used to display the mixer motor.
A symbolic I/O field connected to a text list is used for manual operation via the panel.

Creating a graphics list

Double-click **Graphic lists** in the “Text and graphic lists” folder in the project window.
Double-click in the Name column in the first row to create a new graphics list.
Change the name of the graphics list to "**Motor**".
Under Selection, select "**Range (… - …)**" or "**Bit (0, 1)**".
Below, insert the graphic "**motor_off**" at Value **0** and the graphic "**motor_on**“ at value **1** from the screens template directory.



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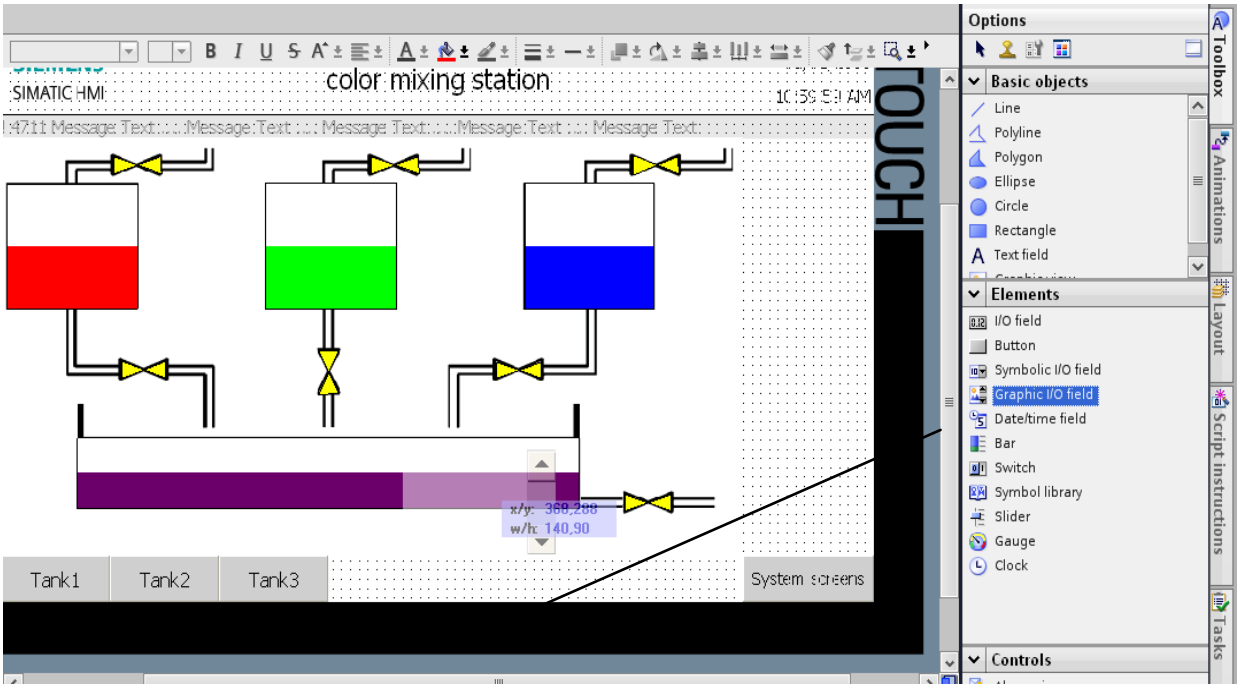
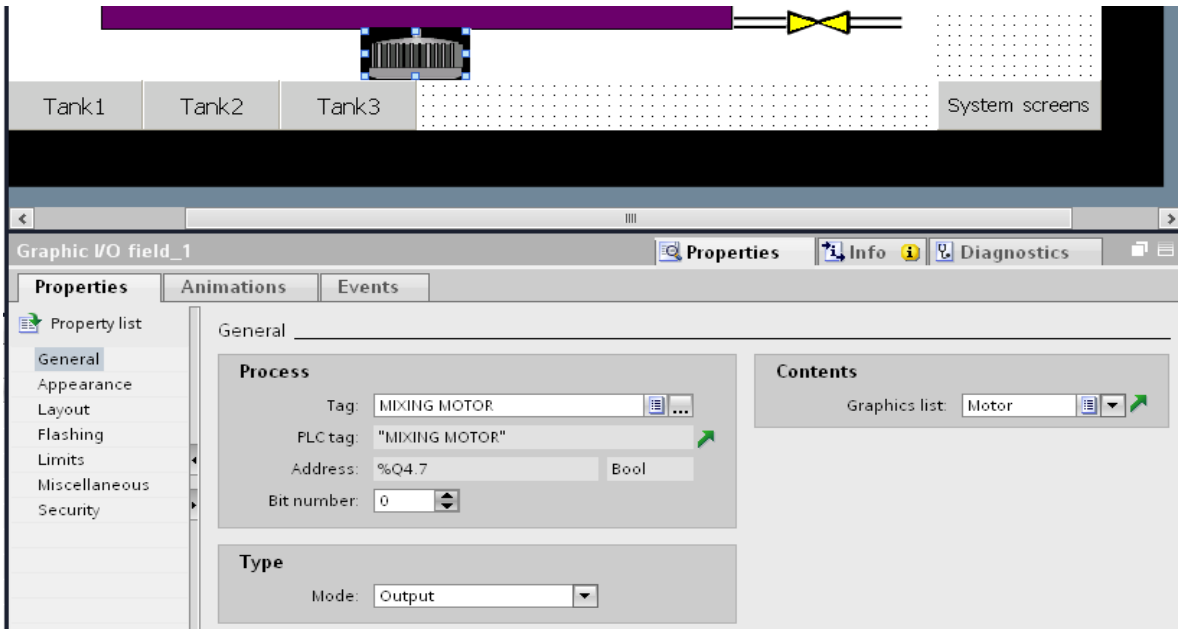
Inserting a graphic I/O field

Drag a graphic I/O field to the root screen.



In the properties, set the mode to **Output** and select the graphics list **Motor** and the tag "**MIXING MOTOR**".
Adjust the size and position.



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Creating a text list

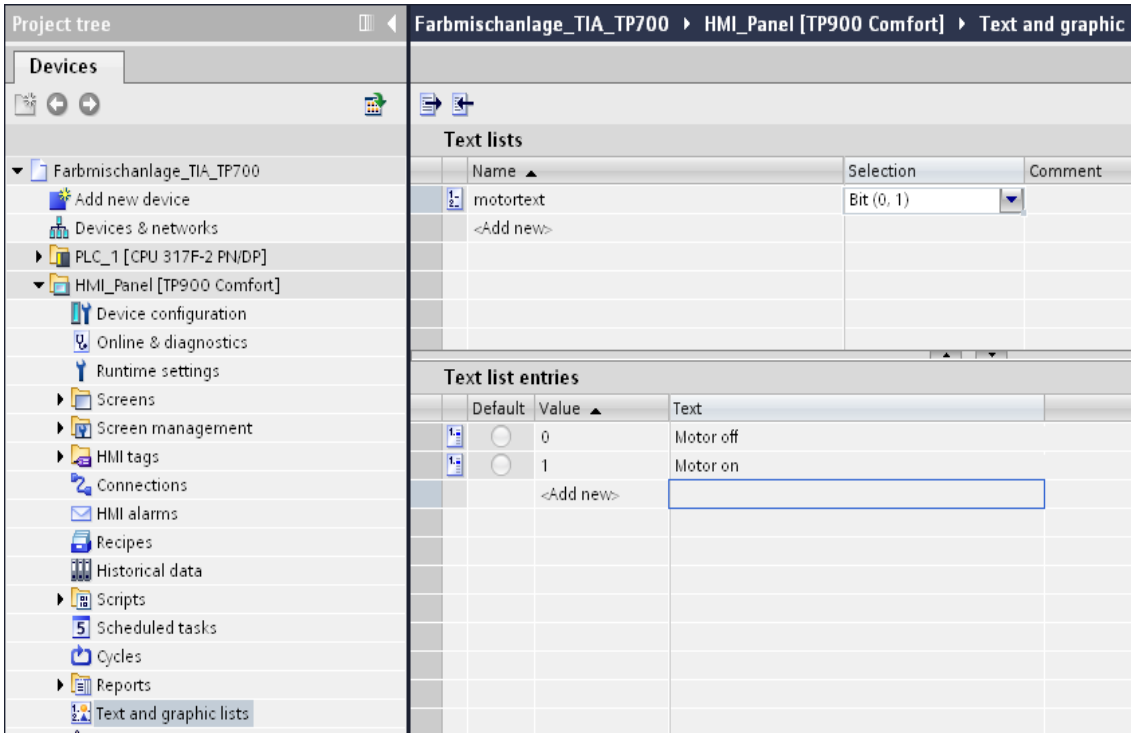
Double-click **Text lists** in the “Text and graphic lists” folder in the project window.

Double-click in the Name column in the first row to create a new text list.

Change the name of the text list to “**Motor text**”.

Under Selection, select "**Range (… - …)**" or "**Bit (0, 1)**".

Below, enter the text "**Motor off**" at Value **0** and the text "**Motor on**" at Value **1**.



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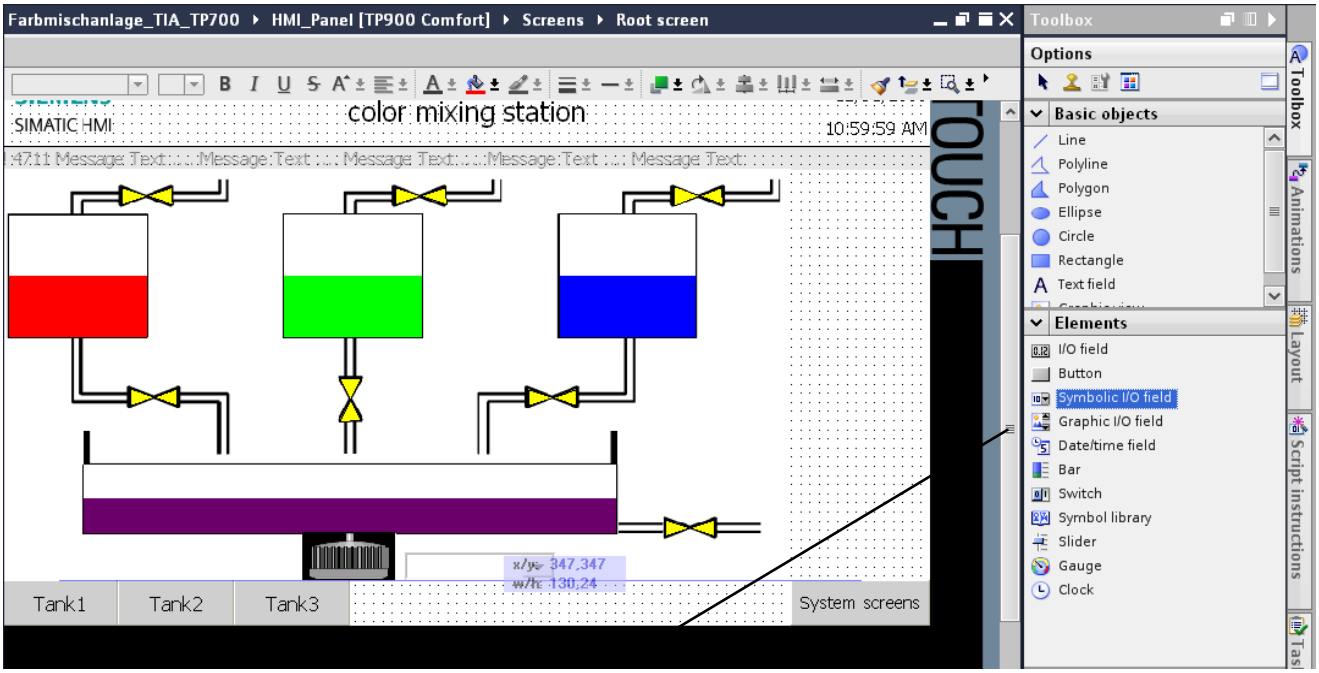
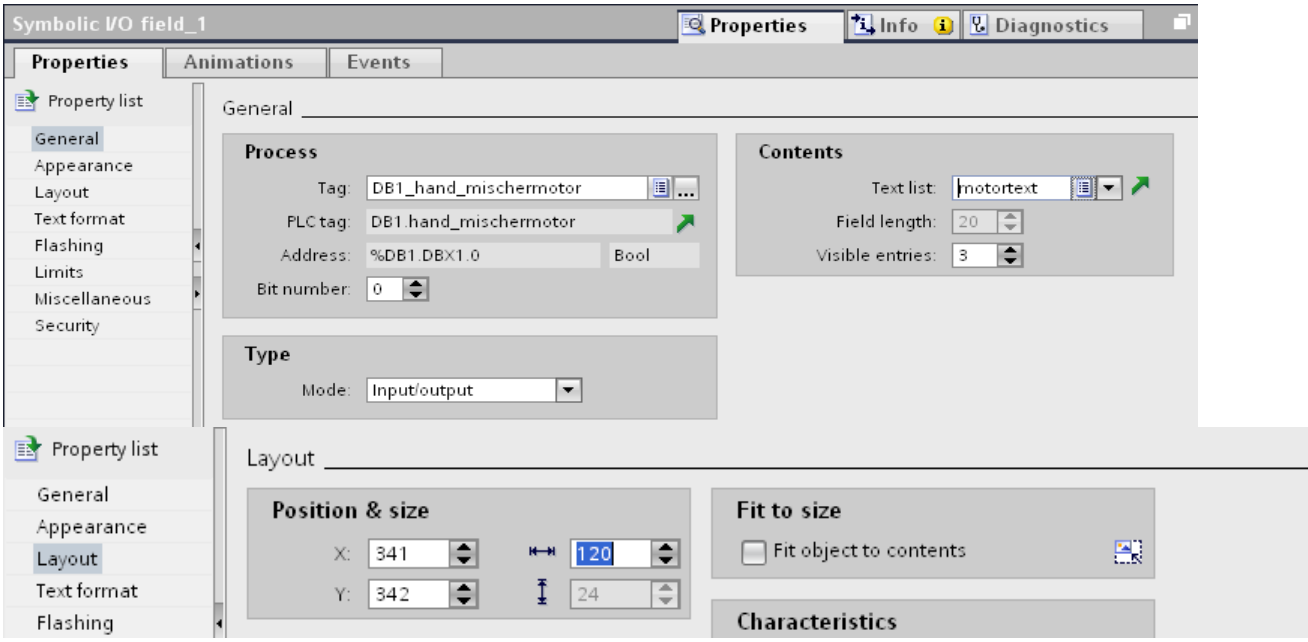
Inserting a symbolic I/O field

Drag a symbolic I/O field to the root screen.



Set mode to **Input/output** and select the text list **Motor text** and the tag "**manual_mixing motor**".

Adjust the **font size**, **size** and **position**.



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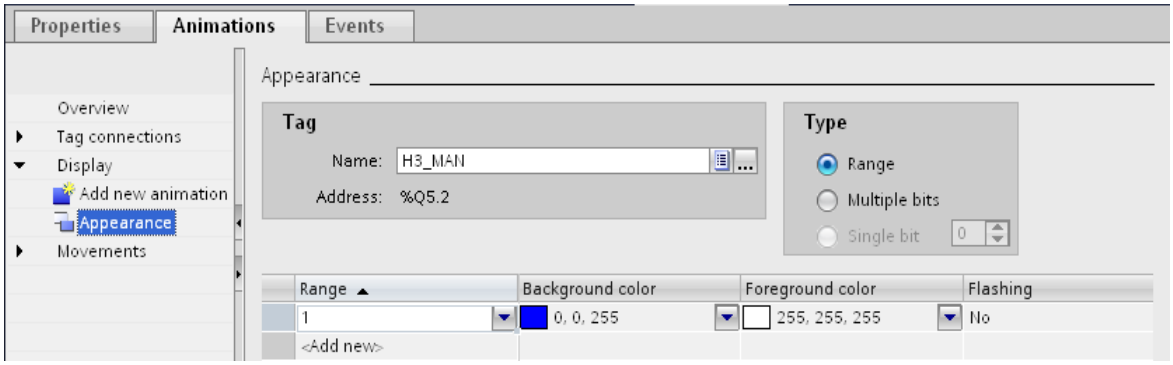
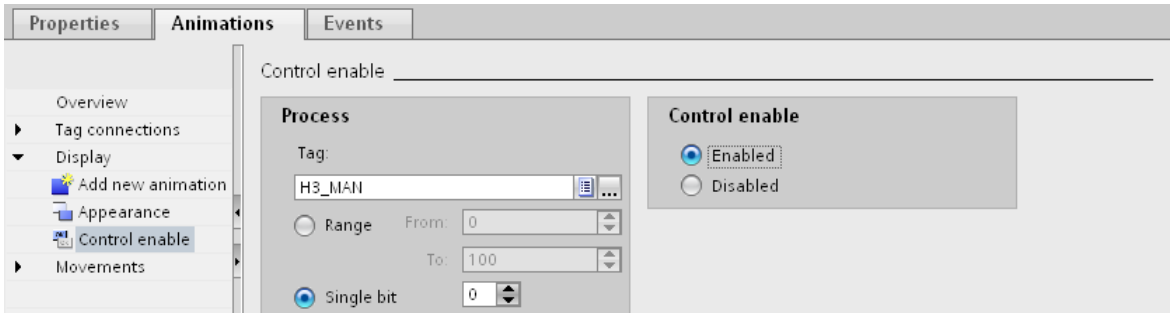
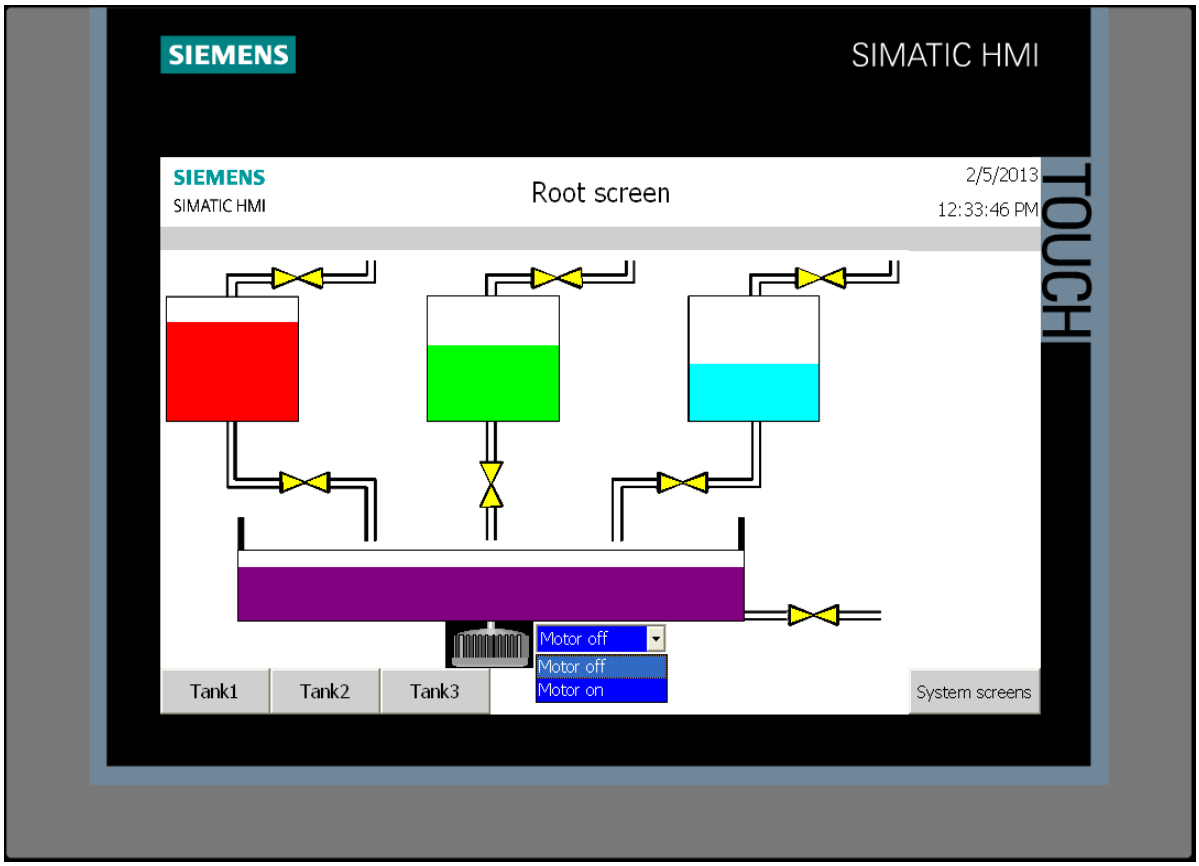
Create an animation which changes the foreground color to **white** and the background color to **blue** for manual mode.



In addition, manual operation should only be permitted in manual mode.



Test the function in Runtime.



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Configuring manual mode for the drain valve of the reservoir

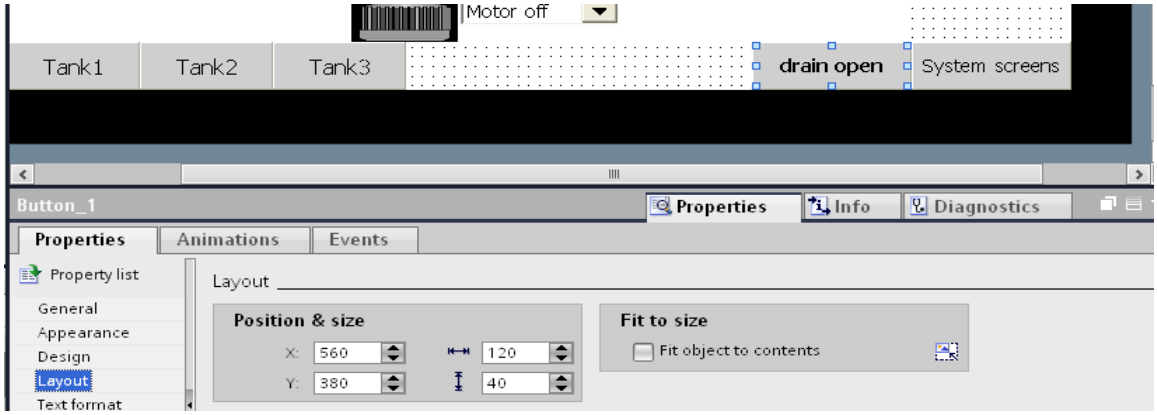
We configure an additional button for opening the drain valve.

From the Tools window, under **Elements**, drag a **button** to the root screen.

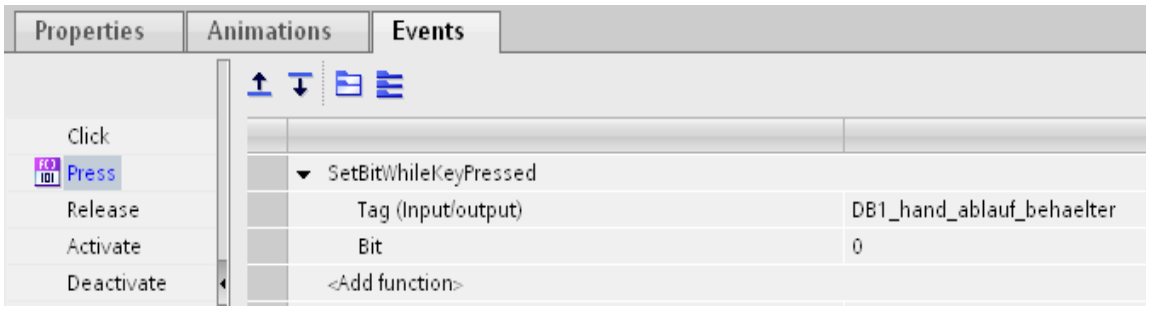
Under General, for Text OFF, enter "**drain open**". Select the **Text ON** check box and enter the text "**drain open**".

Caution! Do not press the Enter key after entering the text; otherwise, a new line will be created.

Set the position and the size.



Under Press, select the function “**SetBitWhileKeyPressed**” in the function list.



Select “**manual_drain_reservoir**” as tag from DB1.

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The button should be operable only in manual mode.

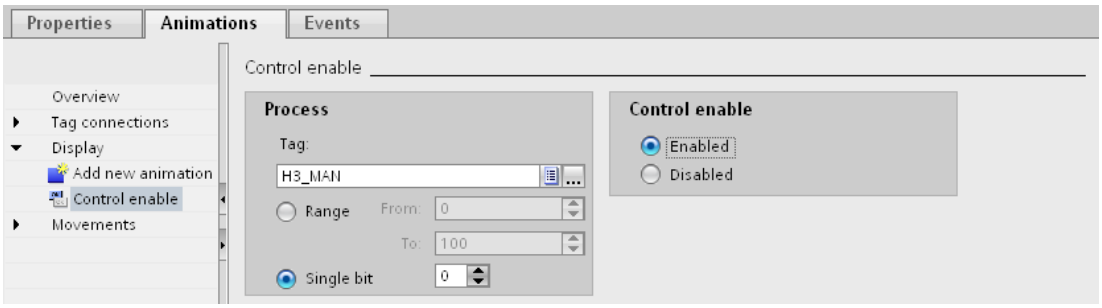
Under **Animations**, select the **Control enable**.

Set the check mark at **Enabled**.

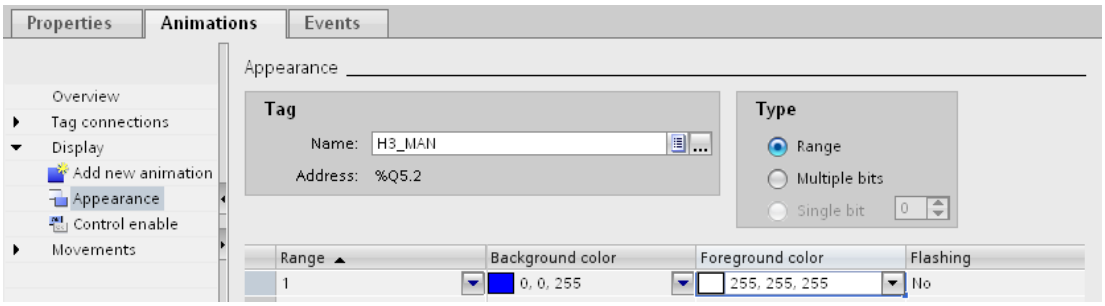
Select "**H3_MAN**" as tag from the symbols.

Set the state to **Enabled**.

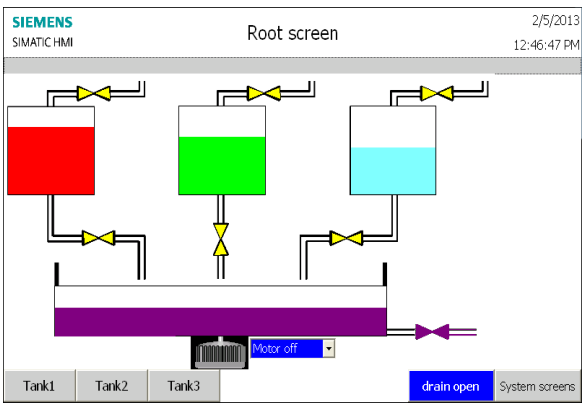
Under Type, select **Bit** with **bit position 0**.

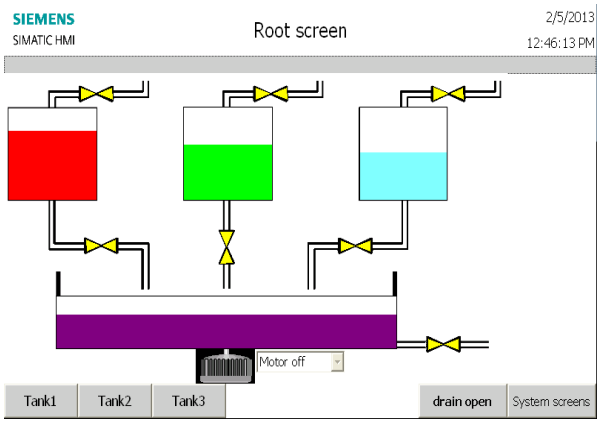


To make the color change visible, change the foreground color to **white** and the background color to **blue** under **Appearance**.



Test the function of the button in manual and automatic mode.





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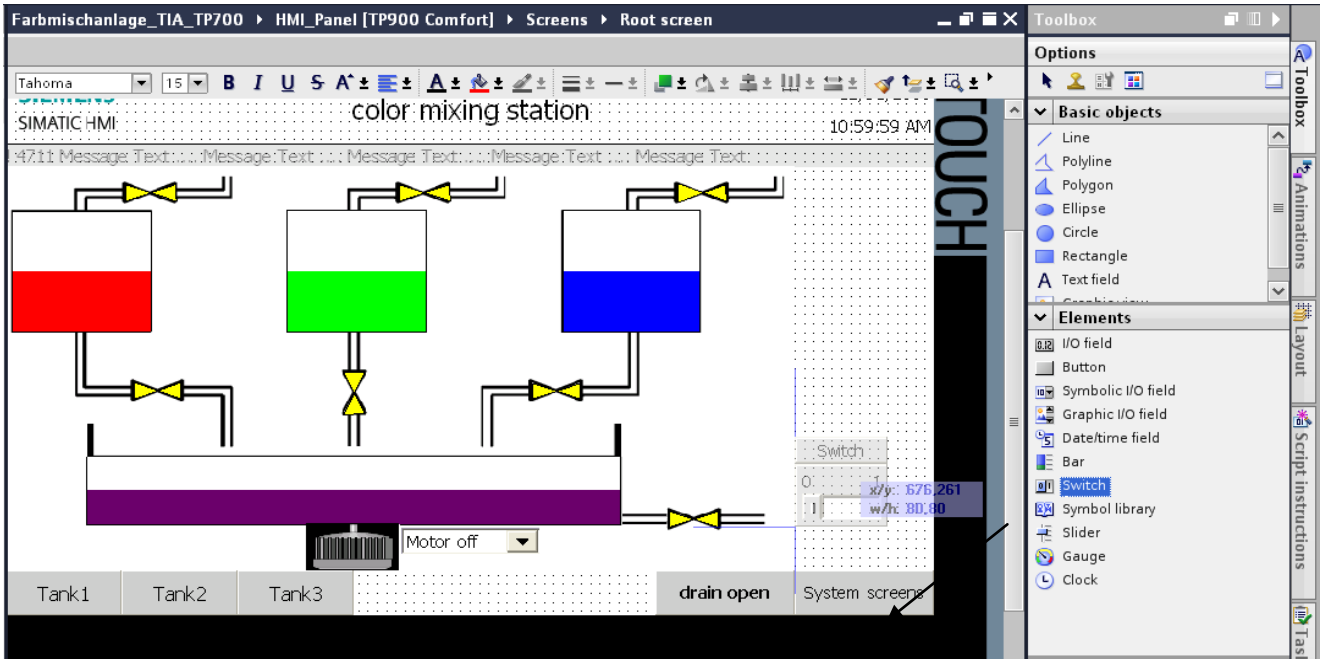
Switching the operating mode

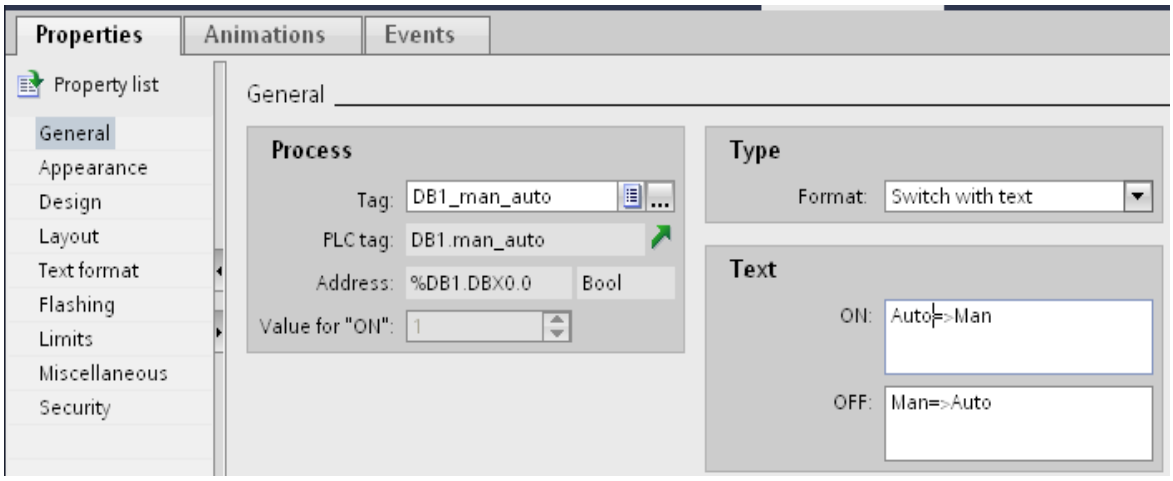
It should be possible to select the operating mode on the TP700 Panel as well.

A switch is used for this function. Drag a switch to the root screen.



Under Settings, select the switch with text and enter the text.

Use “**man_auto**” from DB1 as the tag.



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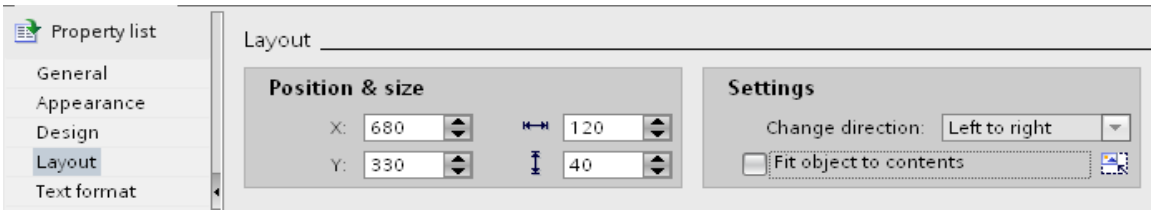
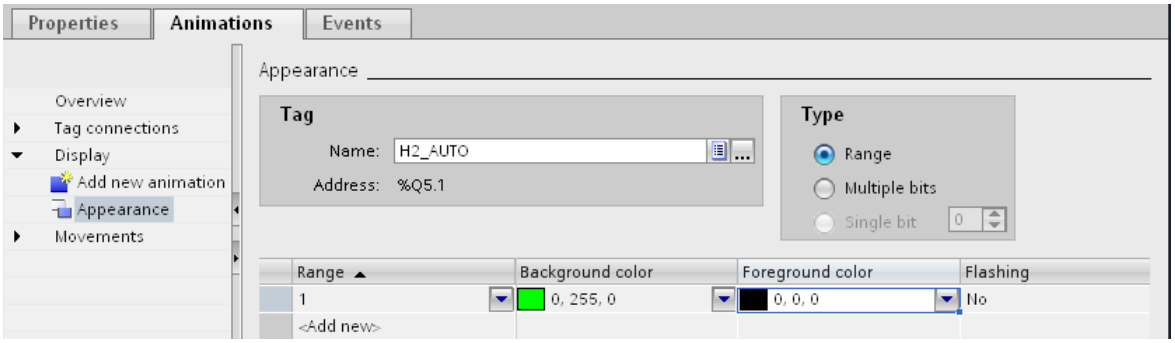
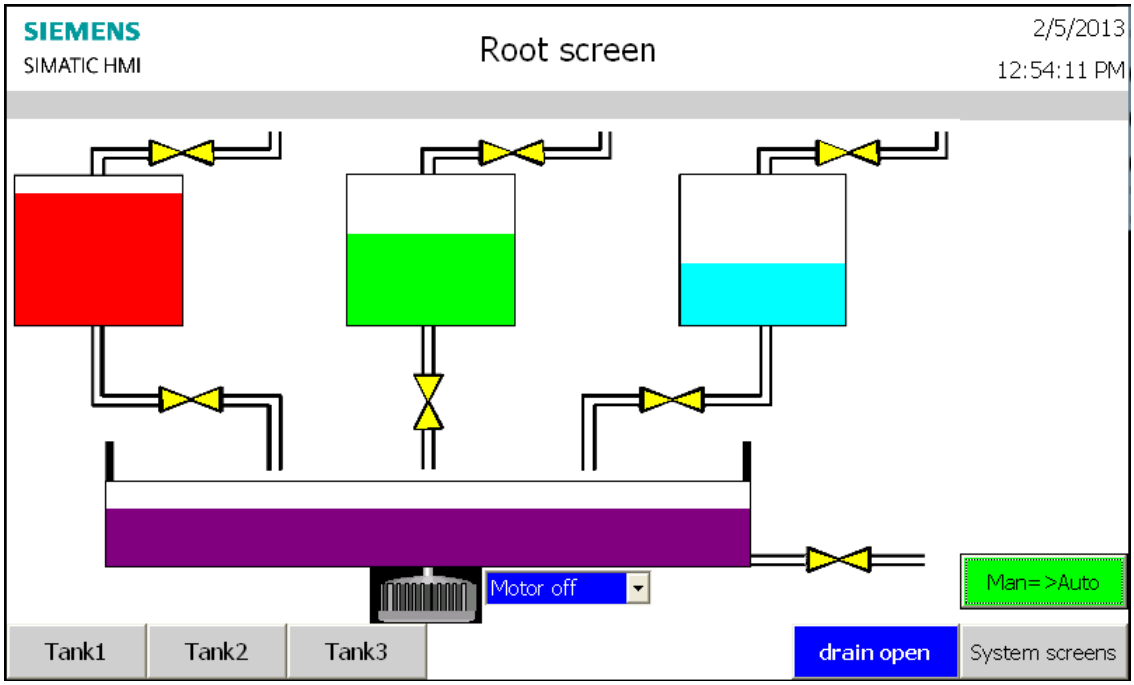
In the properties, change the text color to white and the background color to blue under Appearance; under Text format, select a smaller font size. Set the position and the size under Layout.



Under Appearance, select the tag "**H2_AUTO**" from the symbol table.
In addition, change the foreground color to **black** and the background color to **green**.



Test the manual/automatic switchover in Runtime.



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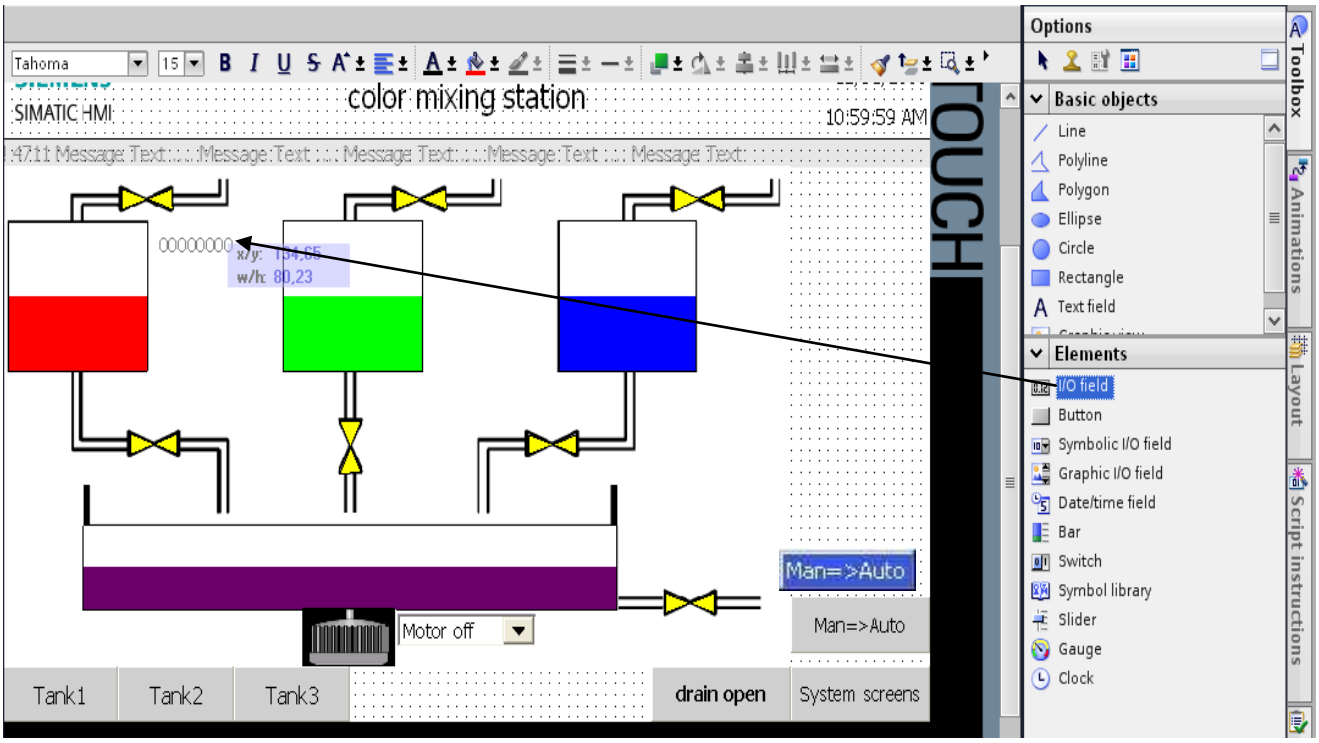
Configuring fill quantities

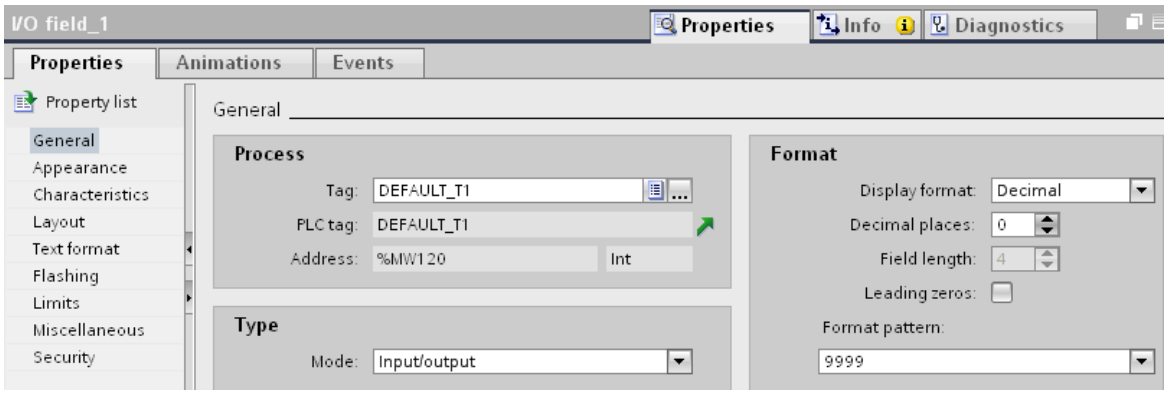
The fill quantities of the tanks are to be input via the TP700 Panel.

Input fields are configured for this purpose.

Drag an I/O field to the root screen.



Change the settings under General. Use the tag "**DEFAULT_T1**".



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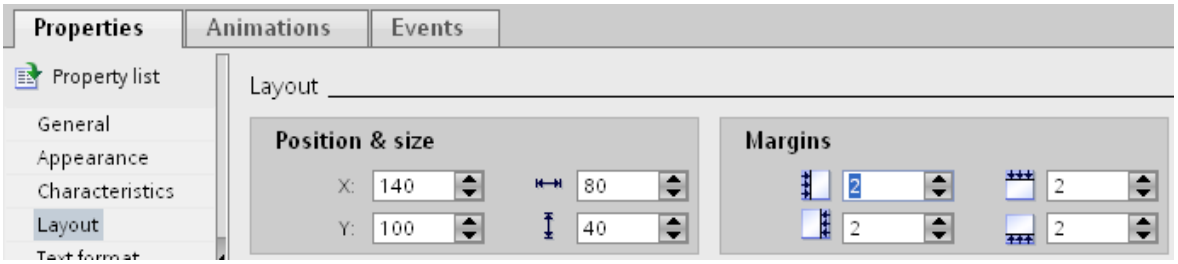
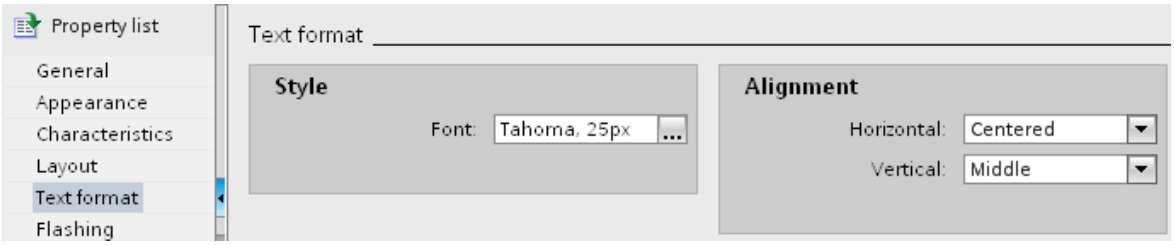
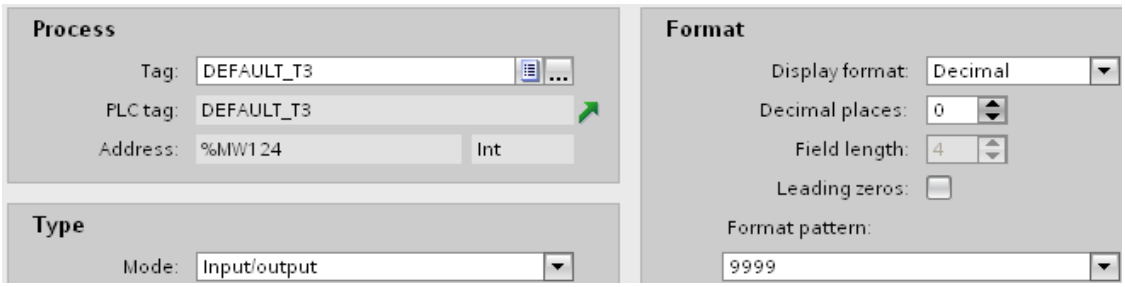
Change the properties under Layout.



Change the properties under Text format.



Copy and **paste** the I/O field. Position it once beside Tank 2 at **X380** and once beside Tank 3 at **X620**. Change the tags to **DEFAULT_T2** and **DEFAULT_T3**.



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Configuring the “START” button

A “START” button is required to start the color mixing station.

The start button should flash green when the start function is enabled by the program.

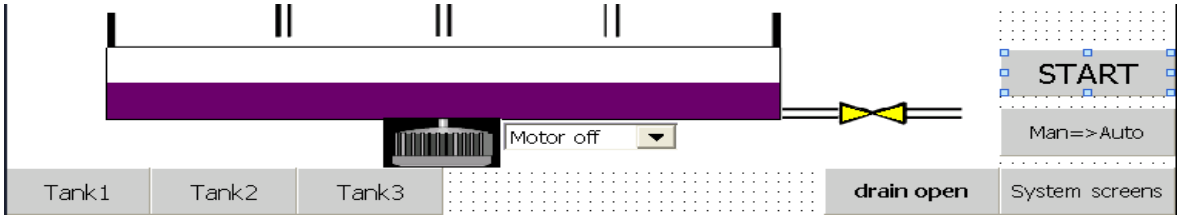
It should only be possible to operate the start button if the start function has been enabled.

From the Tools window, under **Elements**, drag a **button** to the root screen.

Under General, for Text OFF, enter "**START**".

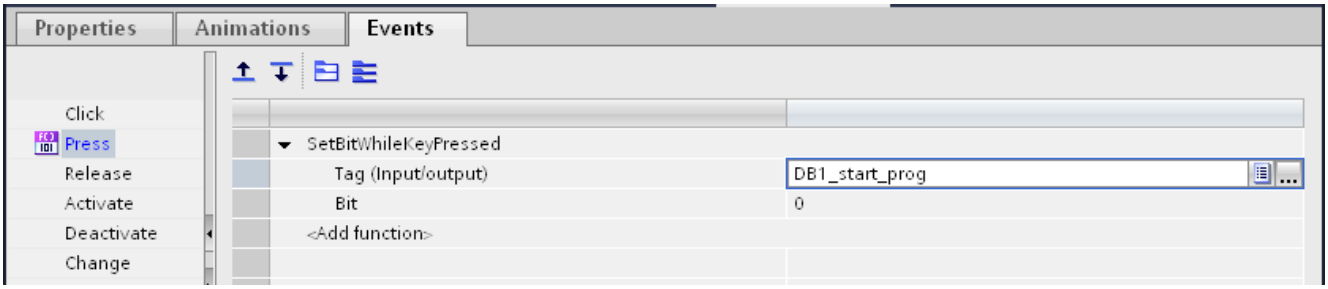
Change the background color to white and select a larger font size.

Set the position **X680**, **Y280** and the size **120 x 40**.



Under Press, select the function “**SetBitWhileKeyPressed**” as event.

Select “**start_prog**” as tag from DB1.



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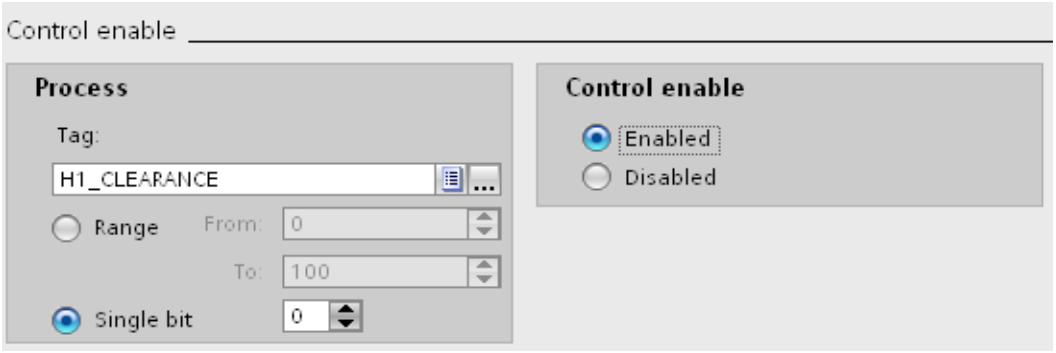
Under **Animations**, select the **Control enable** and set the check mark for **Enabled**.

Select “**H1_CLEARANCE**” as tag from the symbols.

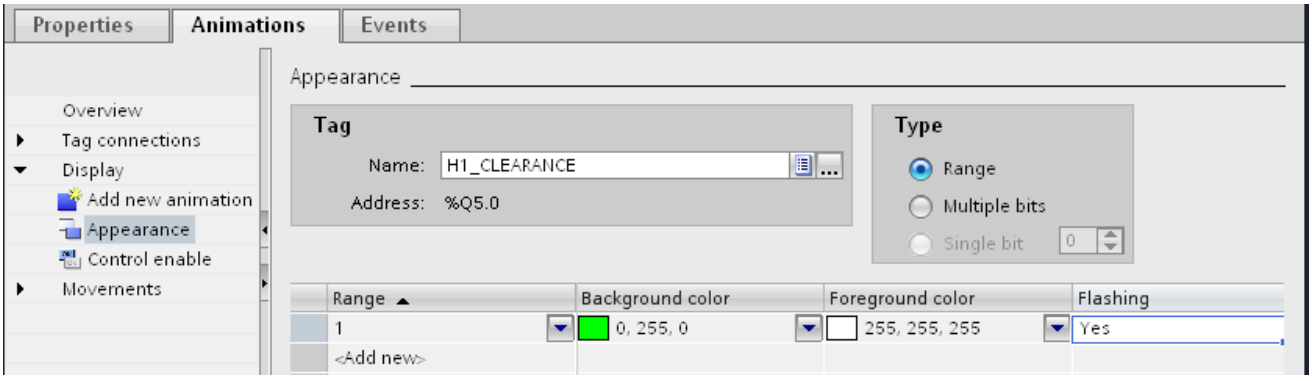


To make the start enable visible, **enable** the **Appearance**.

Use the tag “**H1_CLEARANCE**”.

In addition, change the foreground color to **white** and the background color to **green**.

Set Flashing to “**Yes**”.



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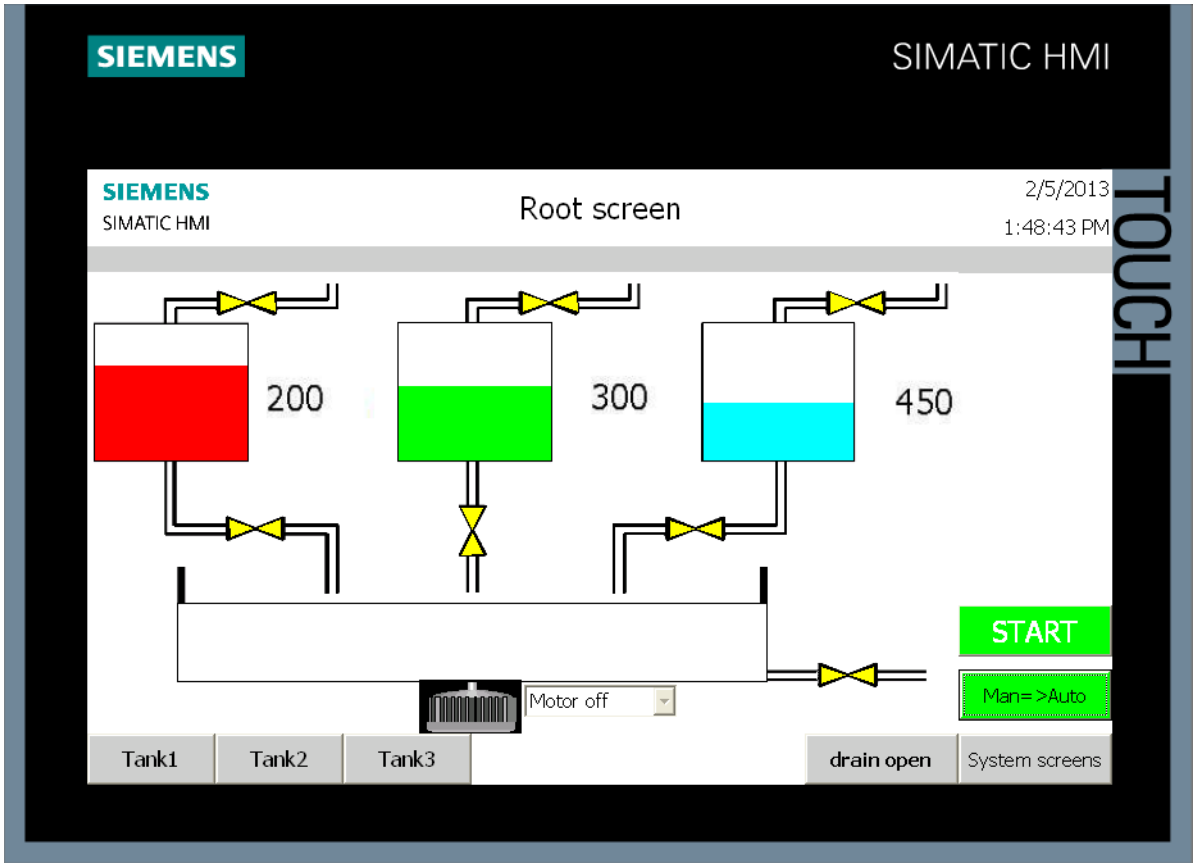
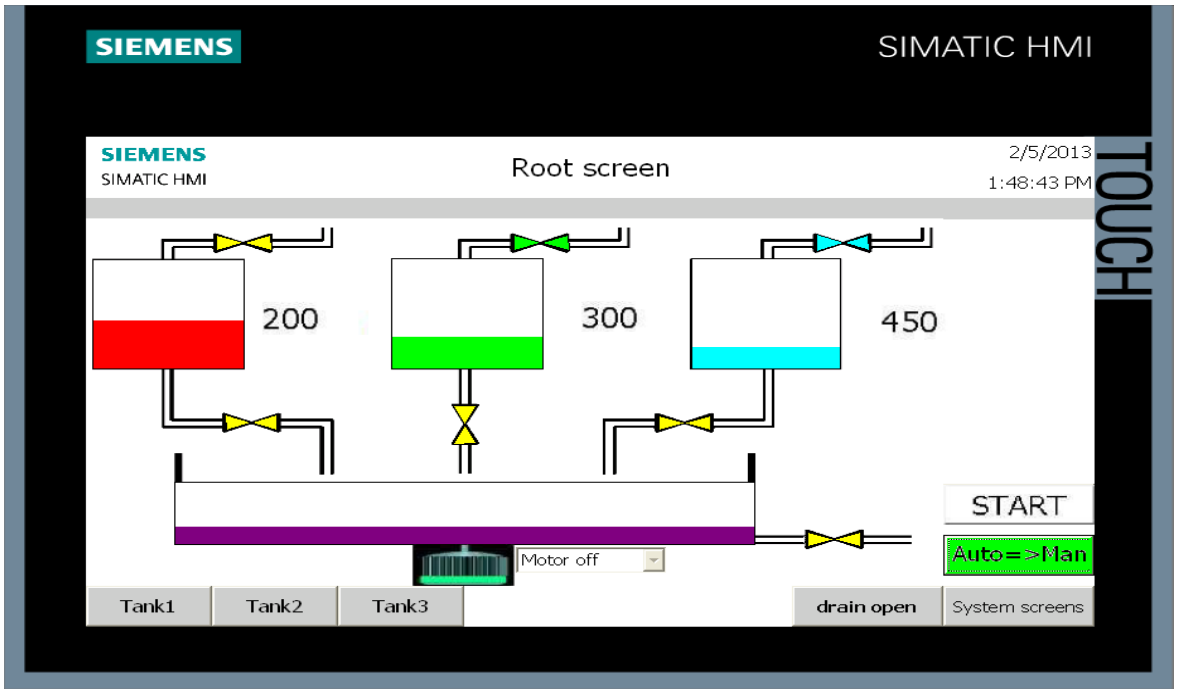
Test the function of the input fields and the START button in Runtime.



Specify the fill quantities in the input fields and start the program.

The start is only enabled if the lower tank reservoir i.e.; if necessary, open the drain valve beforehand in manual mode until the reservoir is empty.



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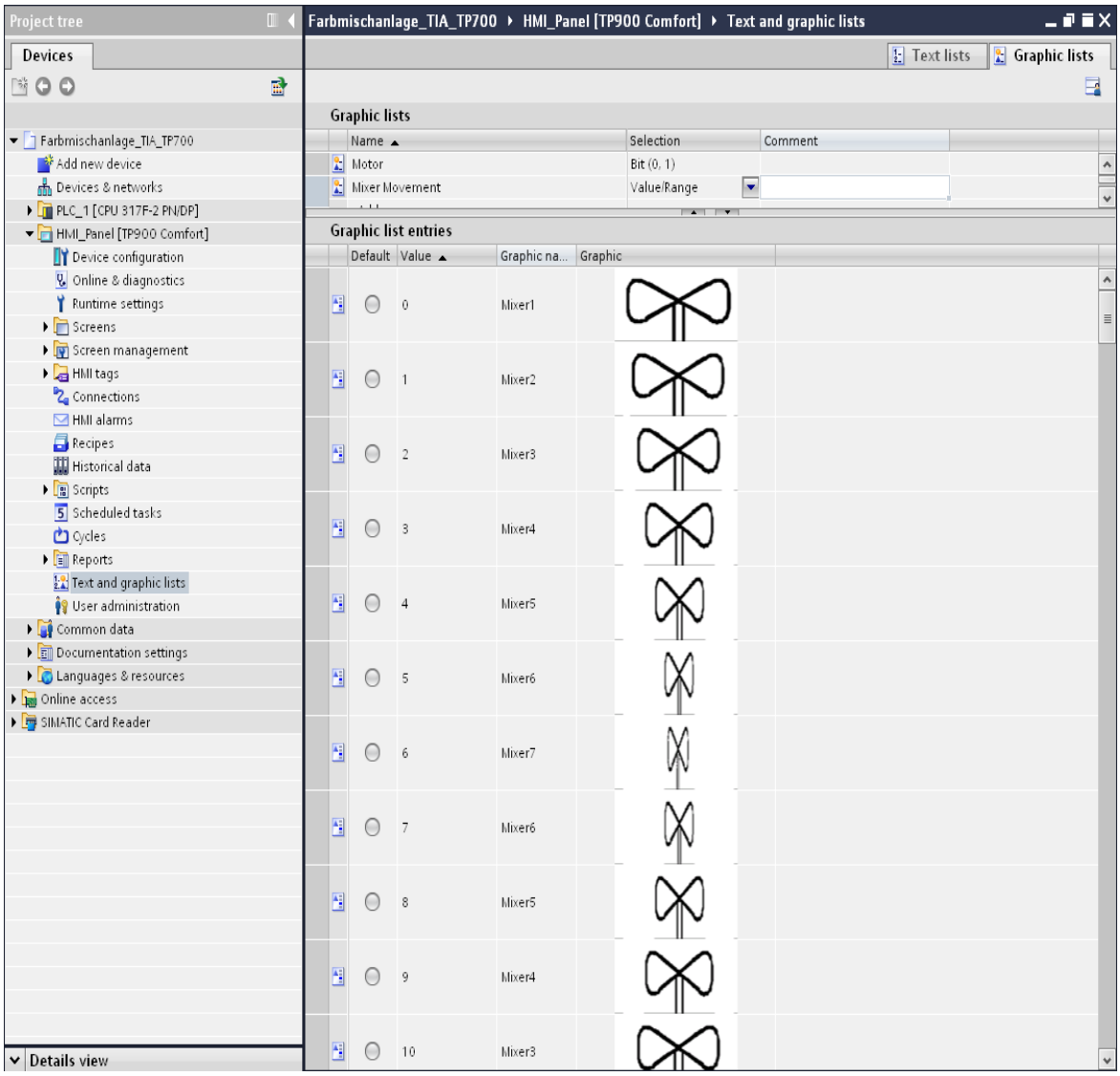
Configuring the mixer movement

A graphic I/O field is used to animate the mixer movement. In this I/O field, the mixer movement is animated as in an animated film using a graphics list.

Create a new graphics list with the name “**Mixer Movement**”.

Under Selection, select **Value/Range.**

From the templates directory, insert the graphics "Mixer1" to "Mixer7" first in ascending order for values 0 to 12 and then in descending order.



The values are continued on the next page

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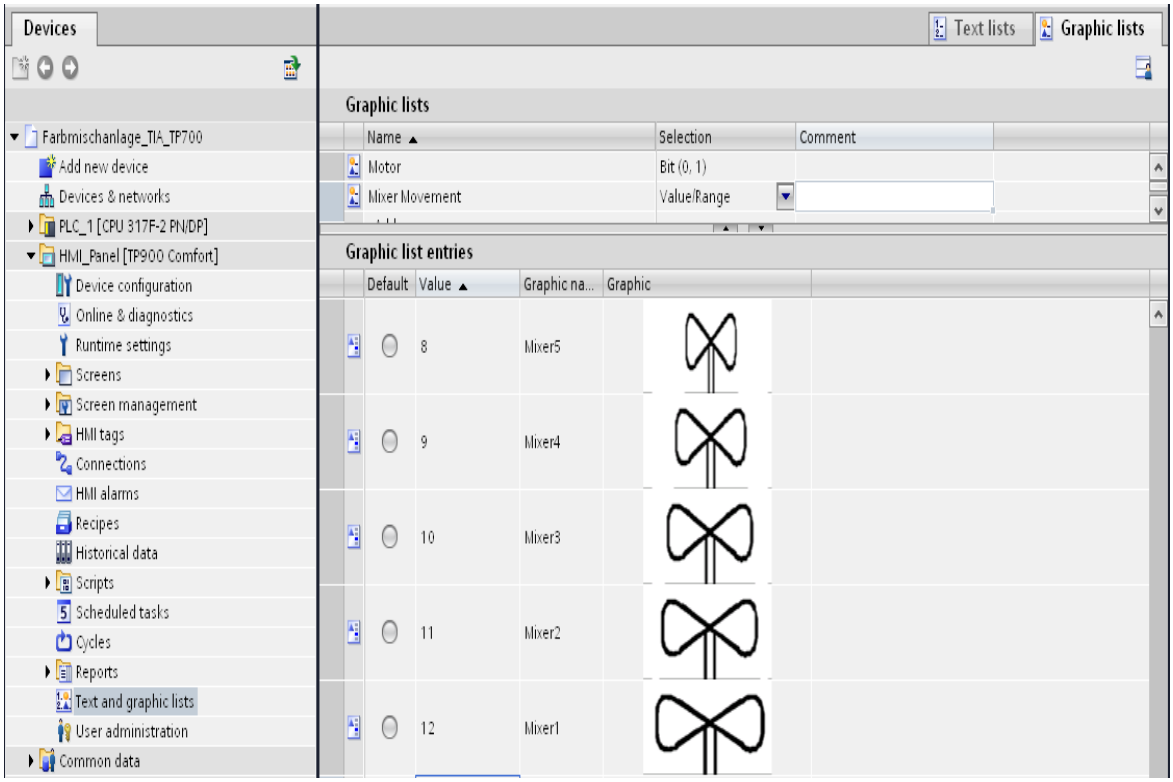
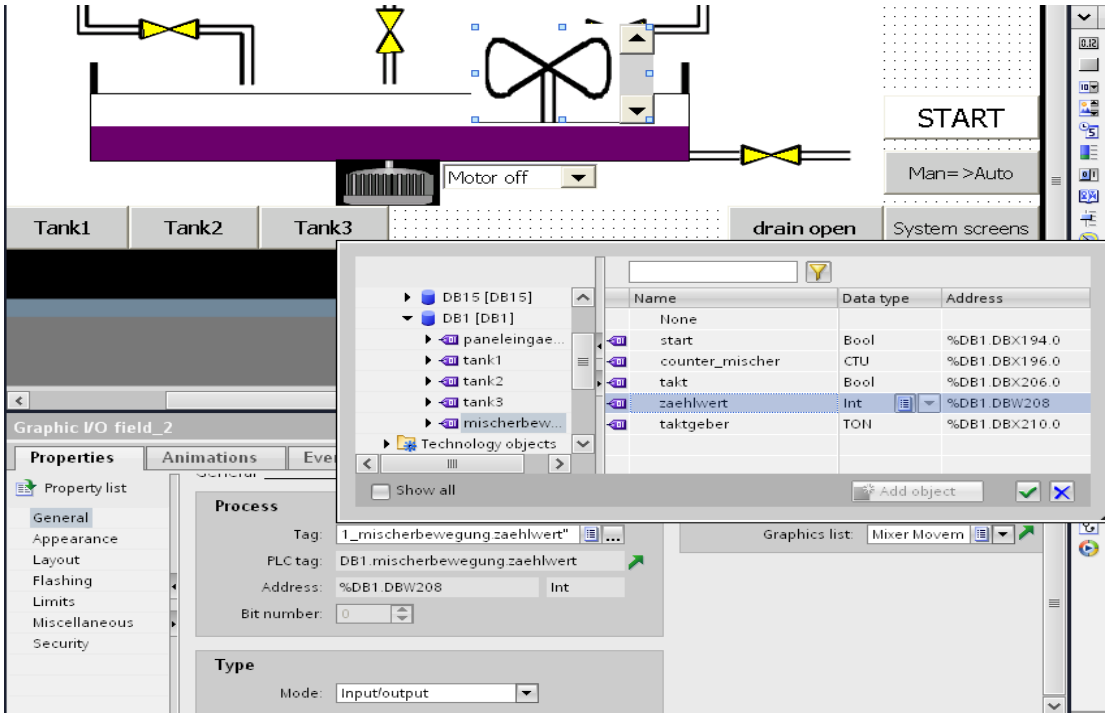


Drag a graphic I/O field to the root screen. Select "**Output**" for mode and the graphics list **"Mixer Movement**" under Display.

As tag, use "**Count value**" from the FB **"Mixer Movement"** in DB1.



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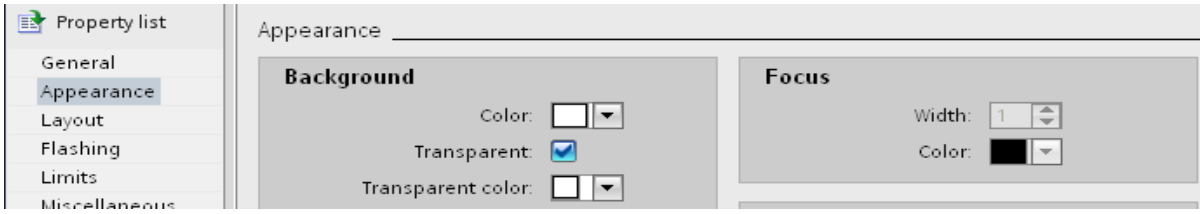
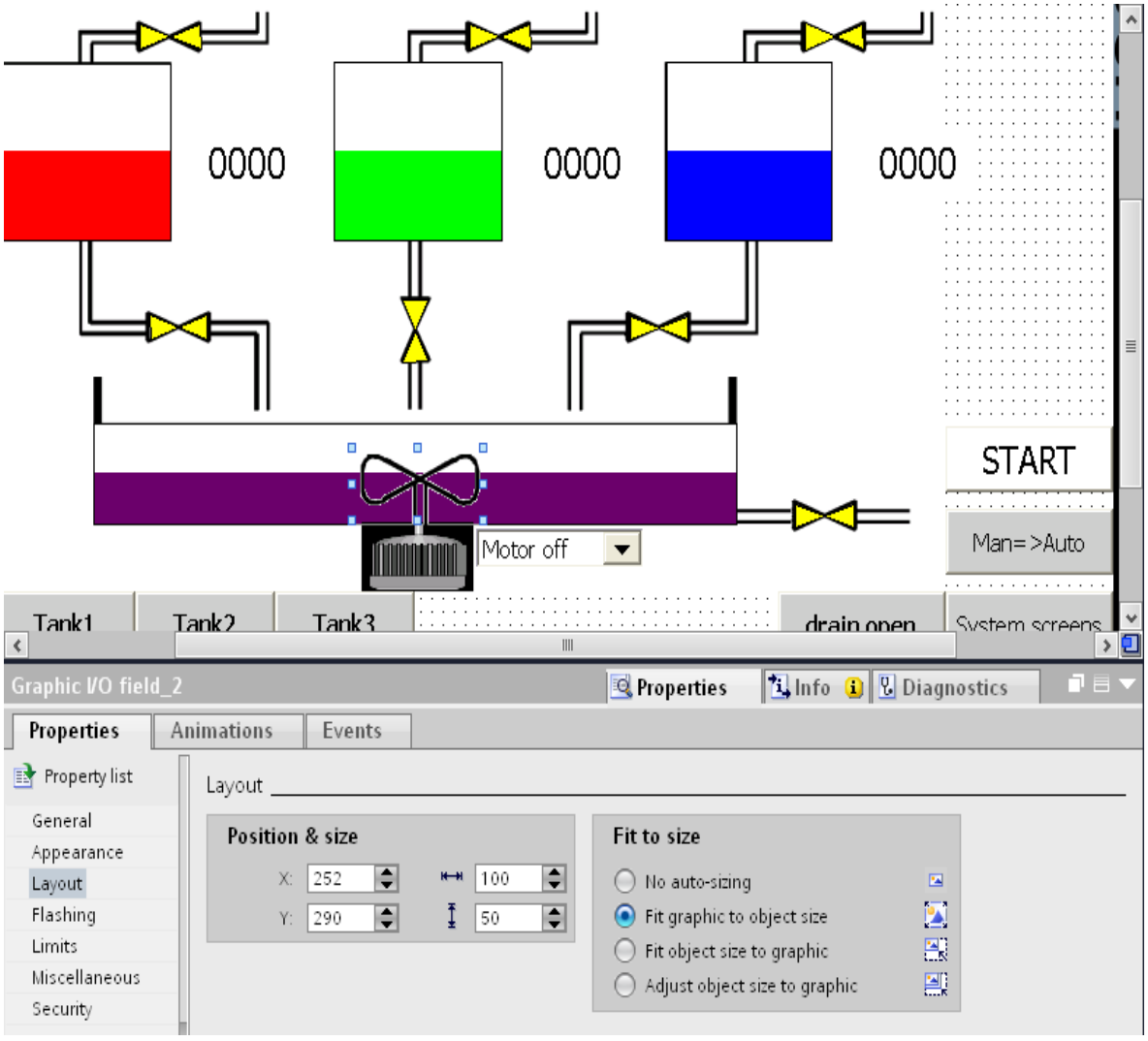
Select white as transparent color and set the check mark.



Set the position and the size.



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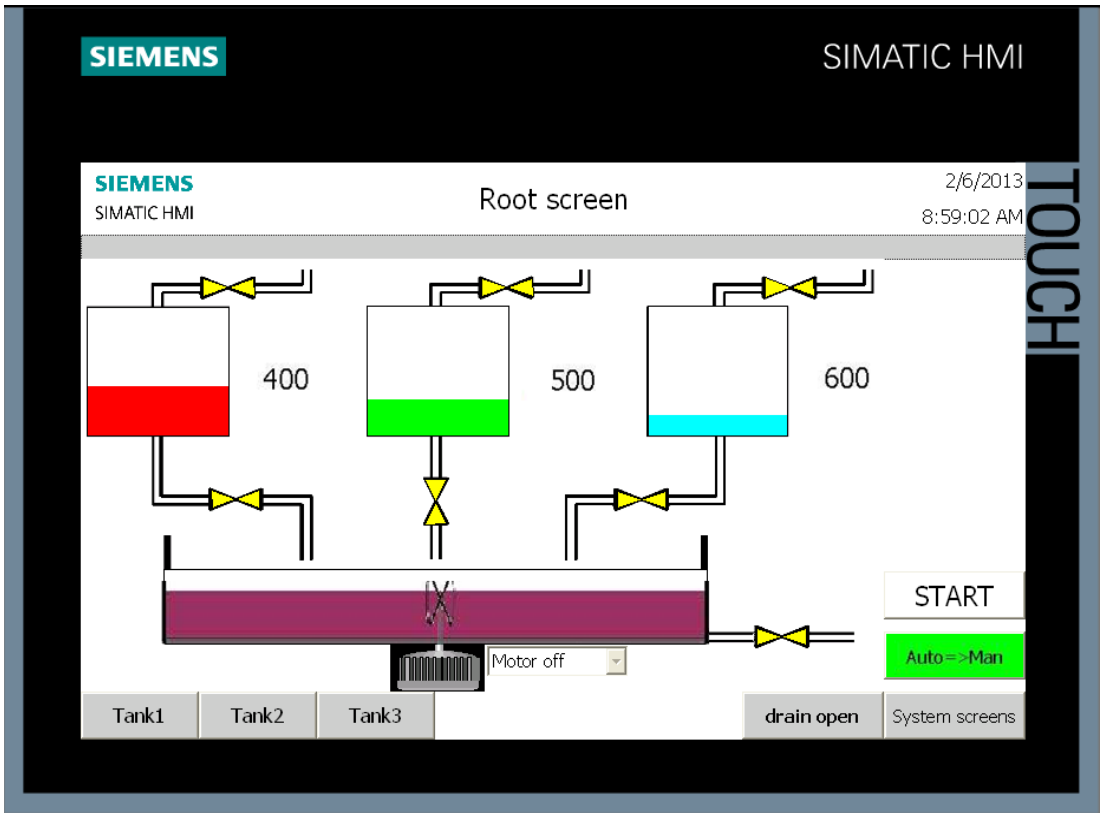
Set the acquisition cycle of the tags to 100 ms to ensure jerk-free movement.

Default tag table

Name	Access mode	Acquisition cycle
DB1_hand_ablauf_behaelter	<absolute access>	100 ms
DB1_hand_ablauf_tank1	<absolute access>	100 ms
DB1_hand_ablauf_tank2	<absolute access>	100 ms
DB1_hand_ablauf_tank3	<absolute access>	100 ms
DB1_hand_mischermotor	<absolute access>	100 ms
DB1_hand_zulauf_tank1	<absolute access>	100 ms
DB1_hand_zulauf_tank2	<absolute access>	100 ms
DB1_hand_zulauf_tank3	<absolute access>	100 ms
DB1_man_auto	<absolute access>	100 ms
DB1_mischerbewegung.zaehl...	<absolute access>	100 ms
DB1_paneleingaenge.start_pr...	<absolute access>	100 ms
DB1_start_prog	<absolute access>	100 ms
DB1_tank1.high_level	<absolute access>	100 ms
DB1_tank1.low_level	<absolute access>	100 ms
DB1_tank2.high_level	<absolute access>	100 ms
DB1_tank2.low_level	<absolute access>	100 ms
DB1_tank3.hand_ablauf	<absolute access>	100 ms
DB1_tank3.hand_zulauf	<absolute access>	100 ms
DB1_tank3.high_level	<absolute access>	100 ms
DB1_tank3.low_level	<absolute access>	100 ms
DB15_start_prog	<absolute access>	100 ms
DB15_vorgabe_tank1	<absolute access>	100 ms
DEFAULT_T1	<absolute access>	100 ms
DEFAULT_T2	<absolute access>	100 ms
DEFAULT_T3	<absolute access>	100 ms
DRAIN_CON	<absolute access>	100 ms
DRAIN_T1	<absolute access>	100 ms
DRAIN_T2	<absolute access>	100 ms
DRAIN_T3	<absolute access>	100 ms
H1_CLEARANCE	<absolute access>	100 ms
H2_AUTO	<absolute access>	100 ms
H3_MAN	<absolute access>	100 ms
MAN_AUTO	<absolute access>	100 ms
MIXING MOTOR	<absolute access>	100 ms
SUPPLY_T1	<absolute access>	100 ms
SUPPLY_T2	<absolute access>	100 ms
SUPPLY_T3	<absolute access>	100 ms

"**Save and load**" the project. Test the mixer movement in Runtime.



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10.4 Configuring objects in the permanent window

The permanent window is used to display the fill levels of the three tanks and the reservoir.

Configuring text fields

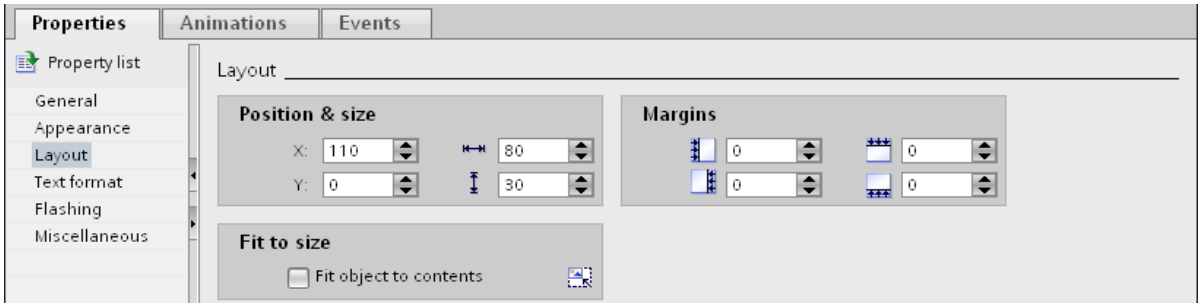
Drag a text field to the permanent window of the root screen.

Enter "**Tank 1**:" as text.

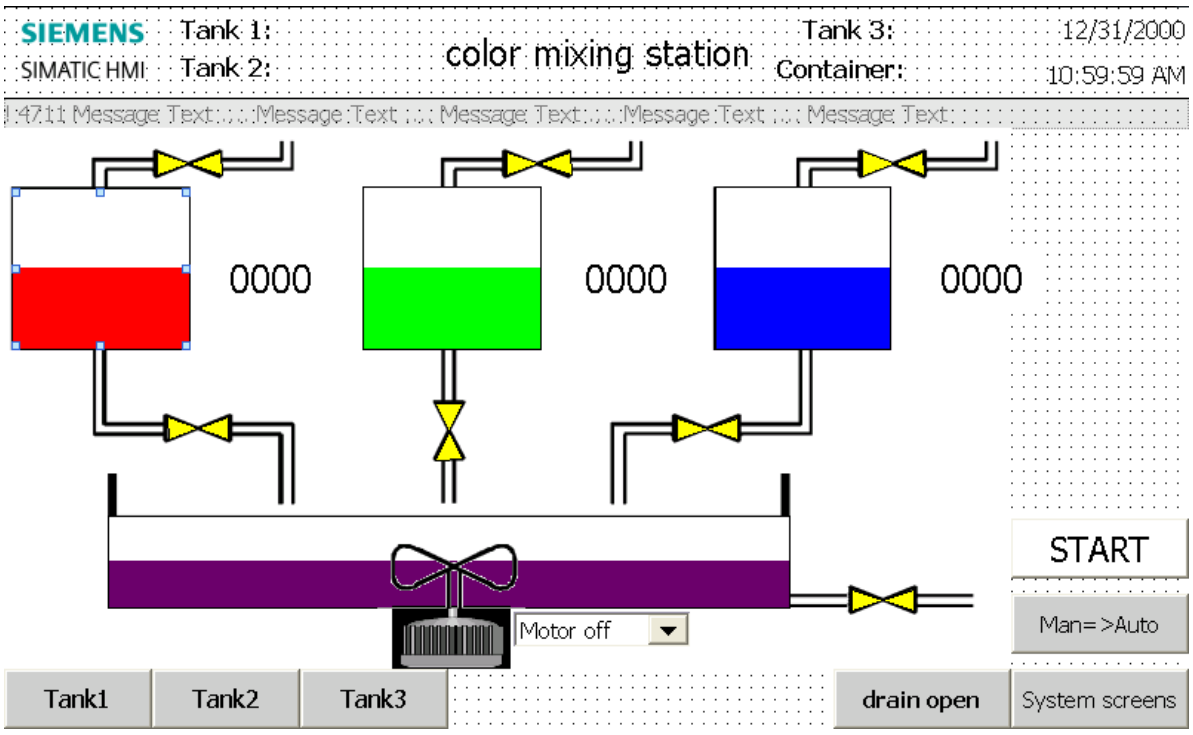
Set the fill style to **transparent**.

Set the position and the size.

Select the font size and change the text alignment.



Copy and **paste** the text field. Change the text and position the text field in such a way that another output field with the size **80 x 30** fits to the right of it.



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Configuring output fields

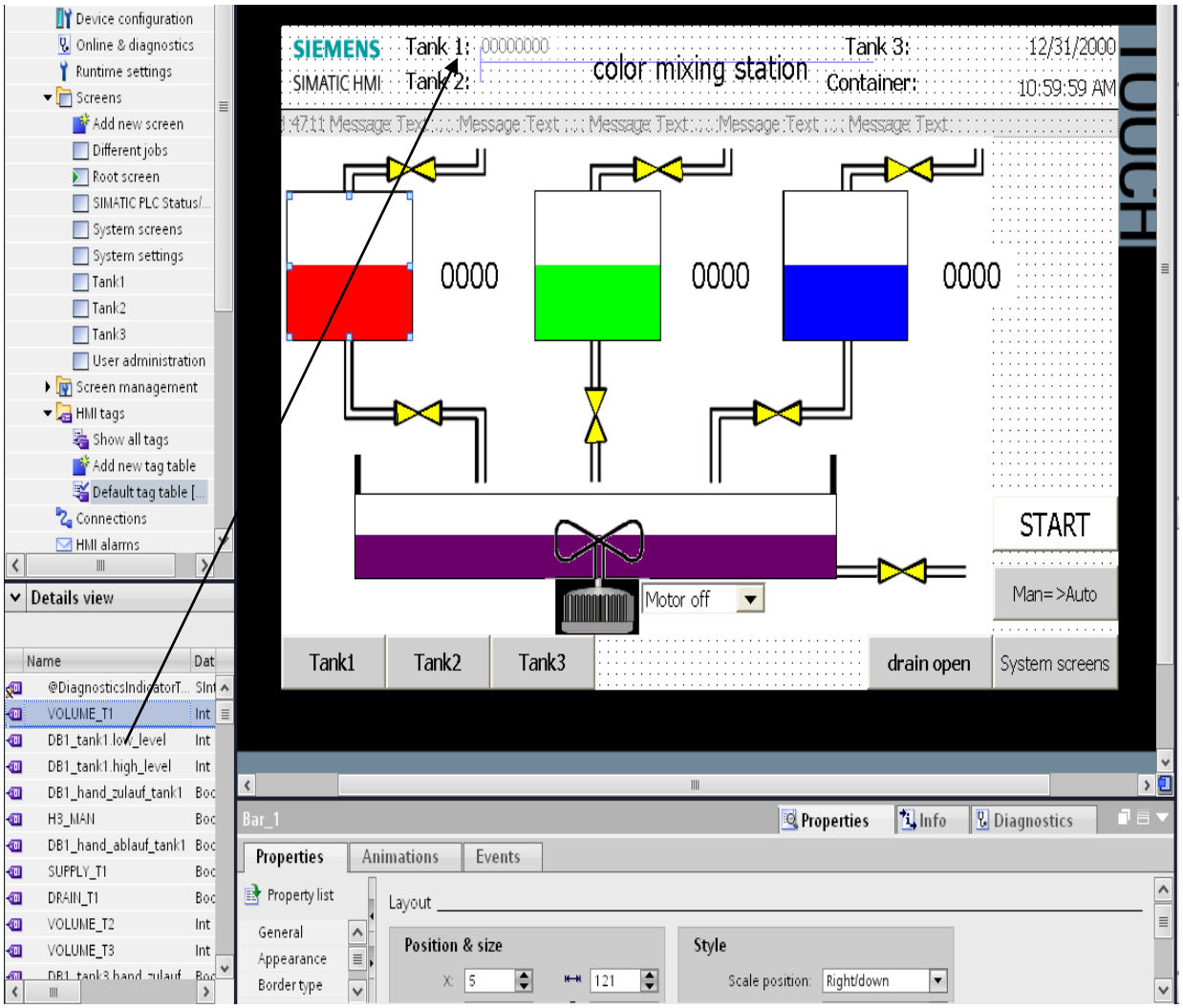
You will use a new WinCC flexible function for the output fields.

To do this, open the object window and pin it in place.

In the project window, click Tags and all tags are displayed in the details view.

With the scroll bar, scroll to the tags of the fill levels (CONTENT_...).

Drag the tag “CONTENT_T1” to the permanent window; an I/O field that is connected to the tag is automatically inserted.



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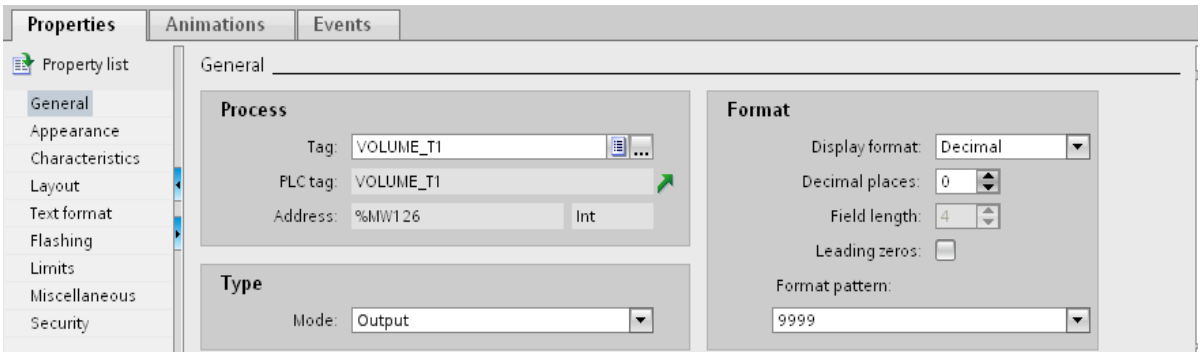
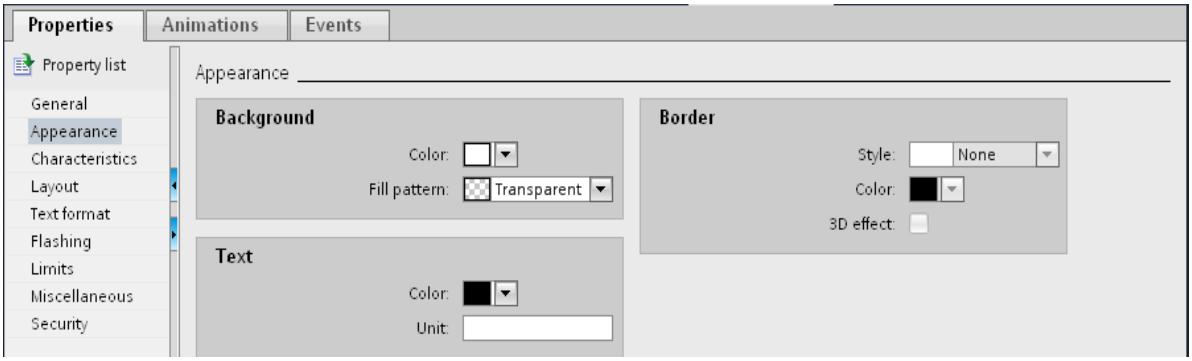
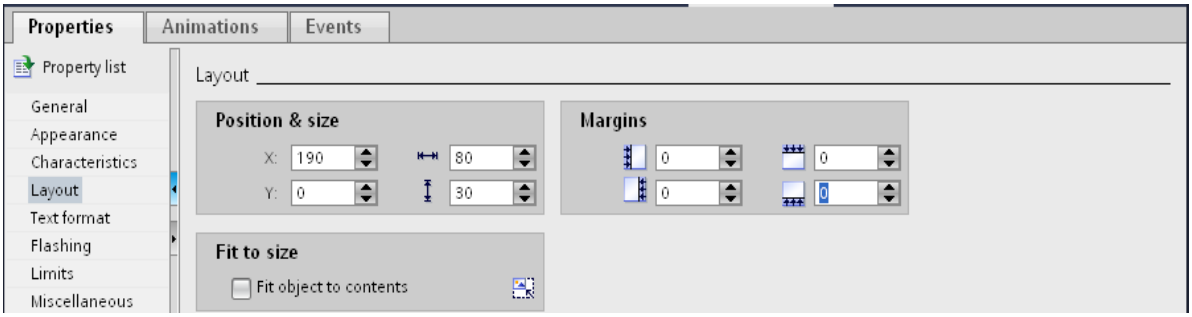
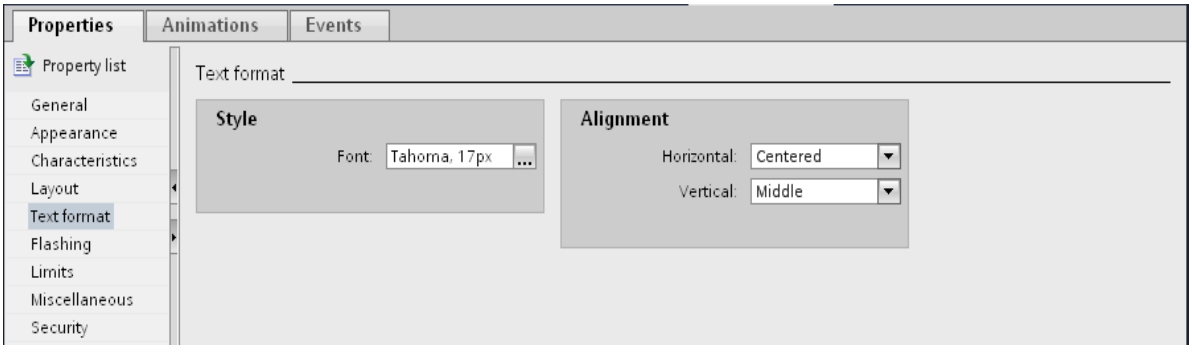
Set the properties.









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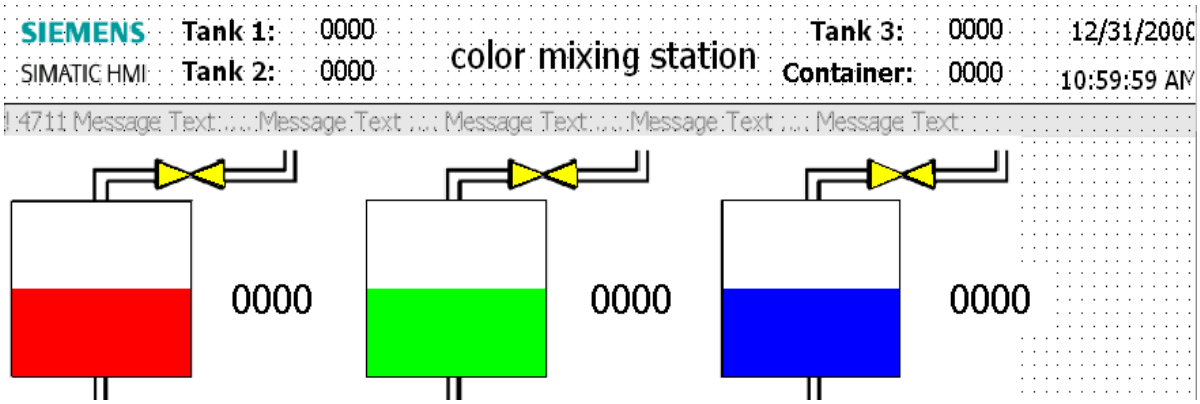
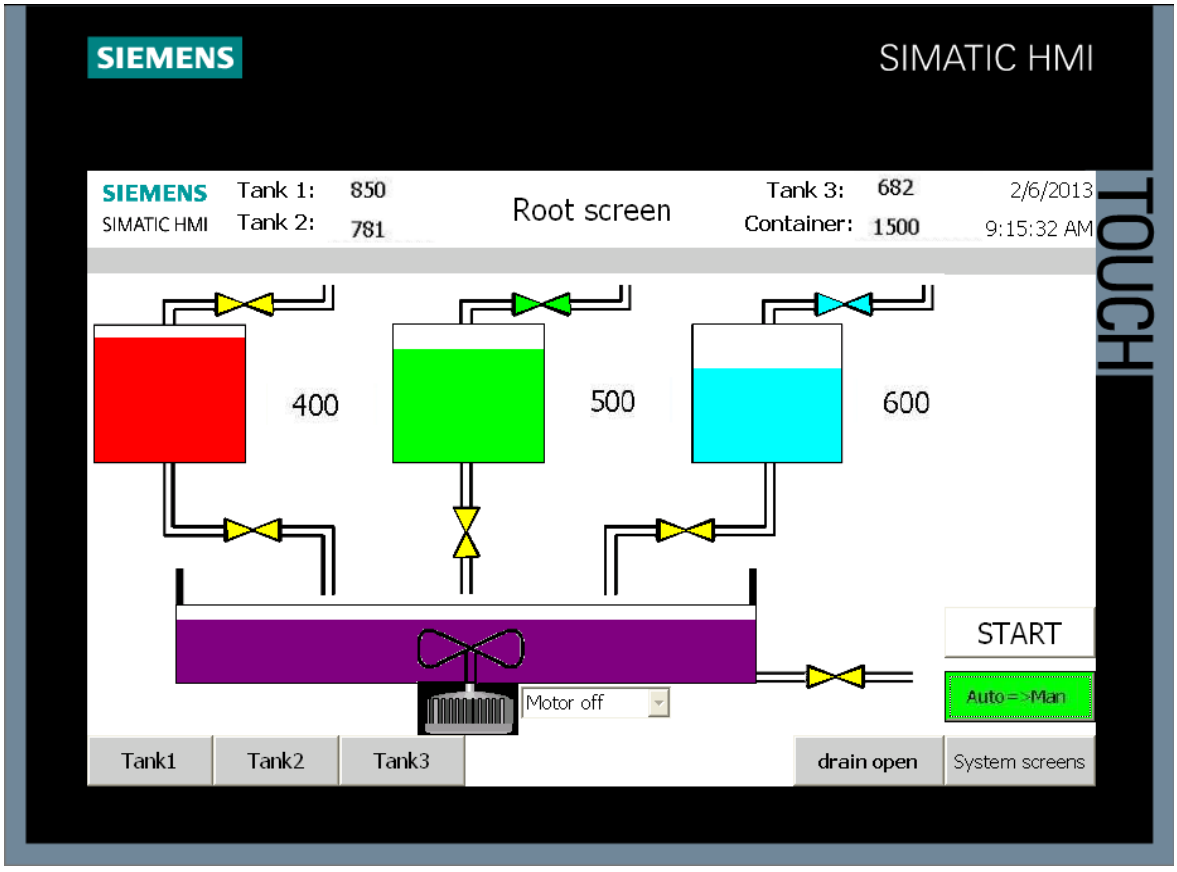
Drag the tags of the other fill levels from the object window to the permanent window and change the properties, or copy and paste the I/O field and change the tag and the position in the properties.



Save and load the project.

Test the objects in the permanent window in Runtime. Switch to the tank screens as well.



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11. Configuring alarms

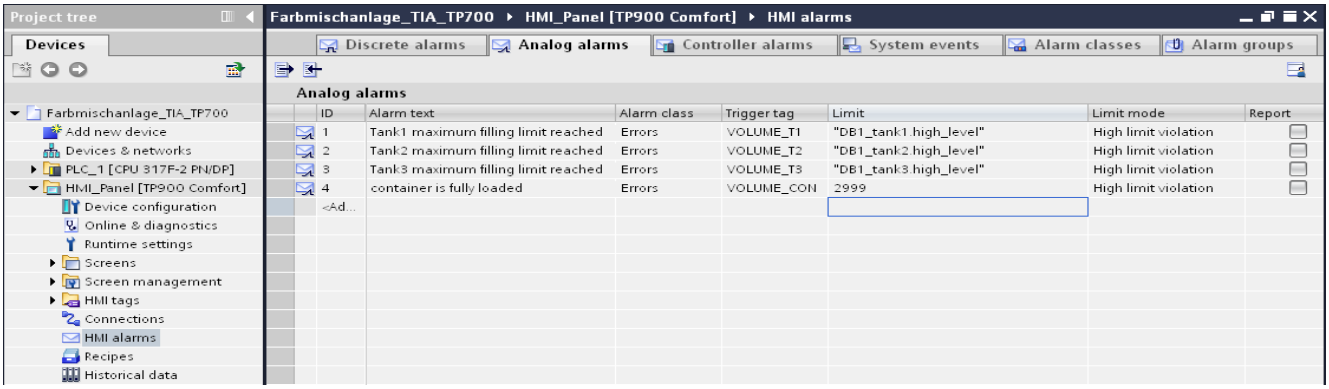
The representation of the color mixing station is now almost complete. Only the alarms are still missing.
Alarms are generated when an alarm bit occurs (discrete alarms) or when a low or high limit is violated (analog alarms).
The alarm texts contain a description of the alarm source with alarm status or just information about the ongoing operation of the plant.
Alarms are grouped into alarm classes such as Warnings or Errors for operating and fault alarms.
Operating messages relate to the states of a machine or a process, while fault alarms indicate interrupts of a machine or a process and must be acknowledged.

11.1 Analog alarms

The fill levels of the three tanks and the reservoir are to be monitored.
If a tank or the reservoir is full, a fault alarm should be output.

Double-click **HMI alarms** in the project window.
Click the **Analog alarms** tab.

Enter the message texts and the monitored tags.
Use the tags of the maximum fill quantities for the limits.
Enter 2999 as constant value for the limit of the reservoir.


Project tree
Devices
Farbmischanlage_TIA_TP700 ▸ HMI_Panel [TP900 Comfort] ▸ HMI alarms
Discrete alarms
Analog alarms
Controller alarms
System events
Alarm classes
Alarm groups
Analog alarms
Farbmischanlage_TIA_TP700
Add new device
Devices & networks
PLC_1 [CPU 317F-2 PN/DP]
HMI_Panel [TP900 Comfort]
Device configuration
Online & diagnostics
Runtime settings
Screens
Screen management
HMI tags
Connections
HMI alarms
Recipes
Historical data
ID | Alarm text | Alarm class | Trigger tag | Limit | Limit mode | Report
1 | Tank1 maximum filling limit reached | Errors | VOLUME_T1 | "DB1_tank1.high_level" | High limit violation
2 | Tank2 maximum filling limit reached | Errors | VOLUME_T2 | "DB1_tank2.high_level" | High limit violation
3 | Tank3 maximum filling limit reached | Errors | VOLUME_T3 | "DB1_tank3.high_level" | High limit violation
4 | container is fully loaded | Errors | VOLUME_CON | 2999 | High limit violation

Note

You can also create multiple alarms for a monitored tag.
To do so, you only need to specify different limits.

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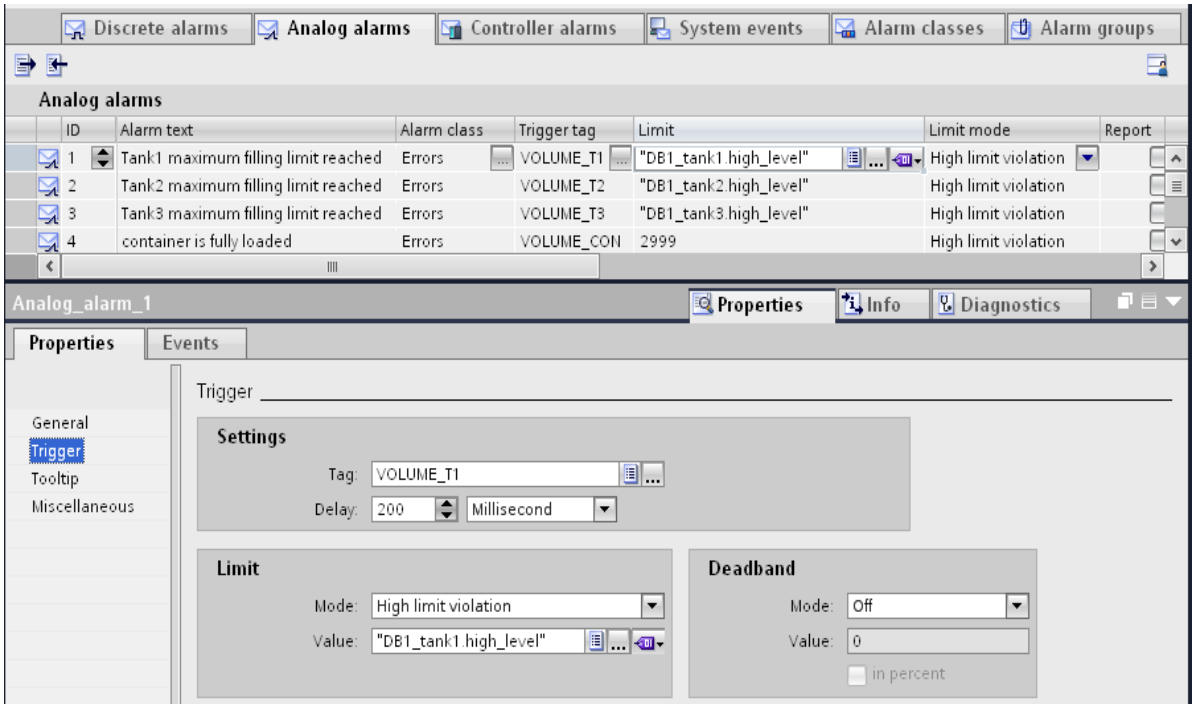
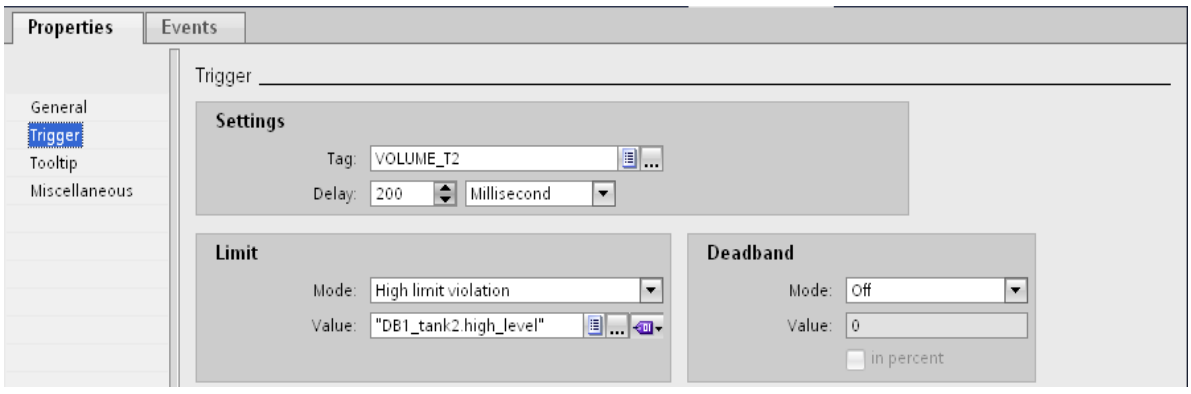
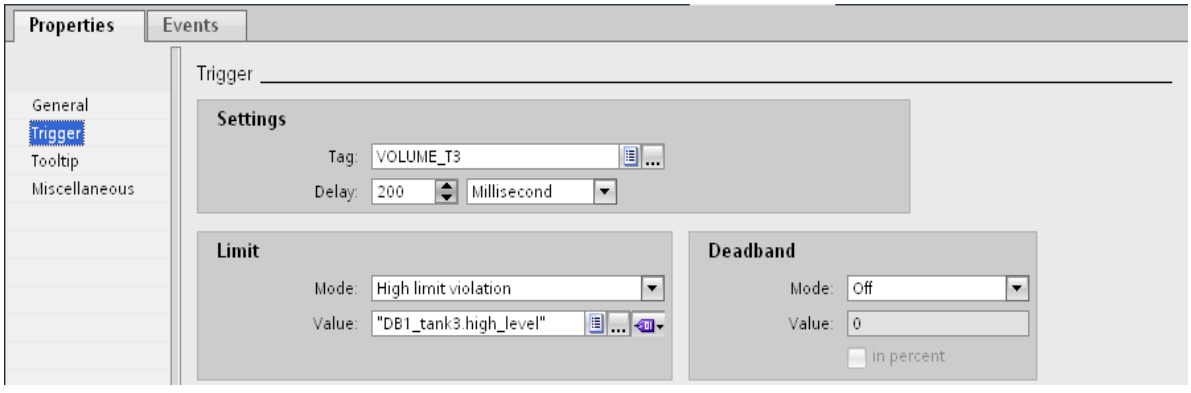
Specifying the delay time

Since the tag limits for CONTENT_T1, CONTENT_T2 and CONTENT_T3 are specified by additional tags, the delay times have to be programmed in the properties under Trigger Settings. This is necessary because these tags are not updated with the controller when the panel is powered up, and these alarms are displayed in the alarm window as a result. Twice the period of the acquisition cycle of the tag should be used for this.

Enter a delay of **200 milliseconds** for CONTENT_T1, CONTENT_T2 and CONTENT_T3.







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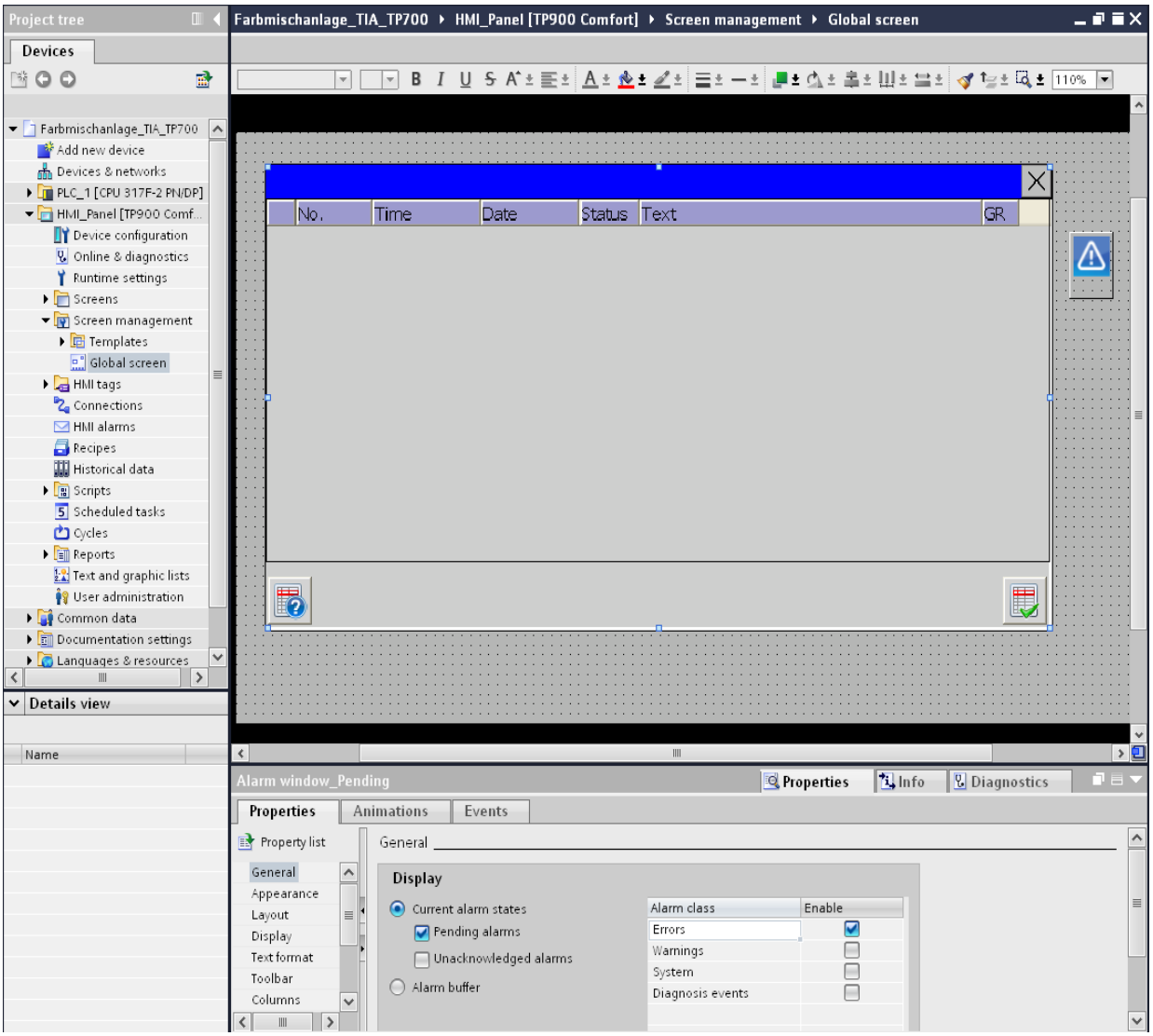
11.2 Alarm window

The alarm texts are to be displayed in an alarm window. The alarm window is configured in the template screen. As a result, it is automatically embedded in the background of all other screens.

Open the screen "**Global screen**" by double-clicking in the project window under "**Screen management**".
An alarm window and the alarm indicator are already configured here.



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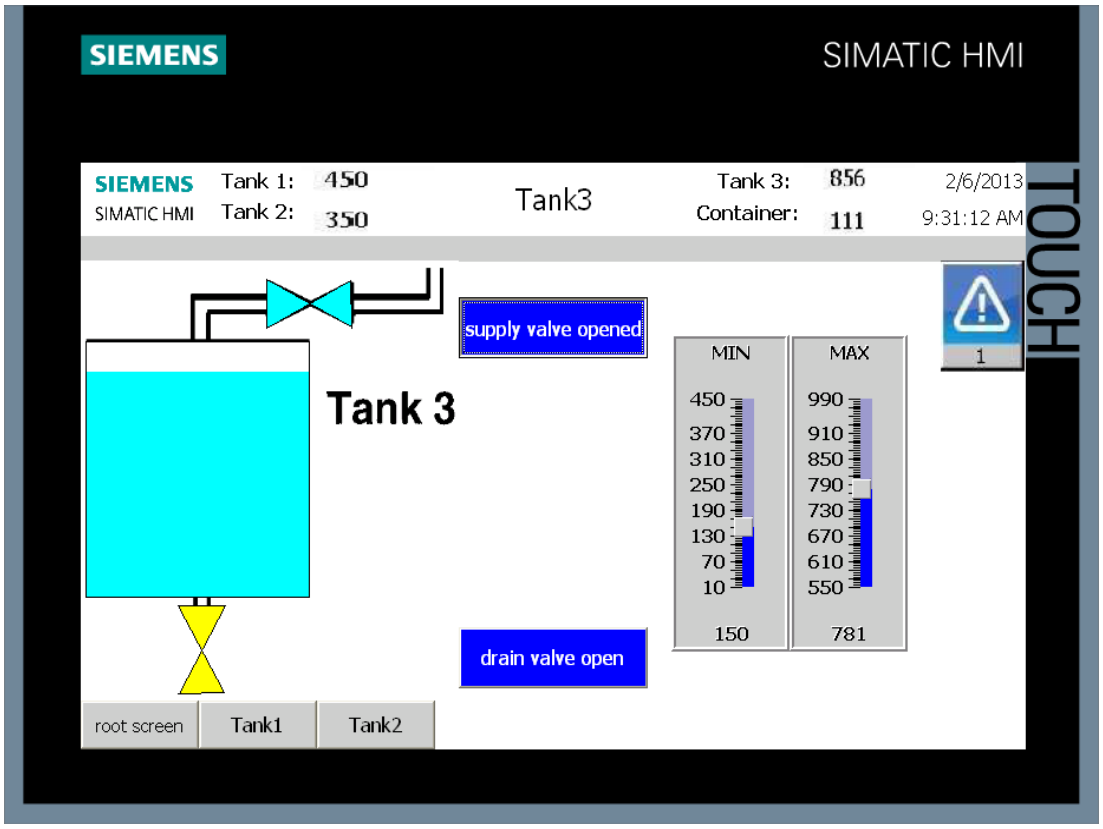
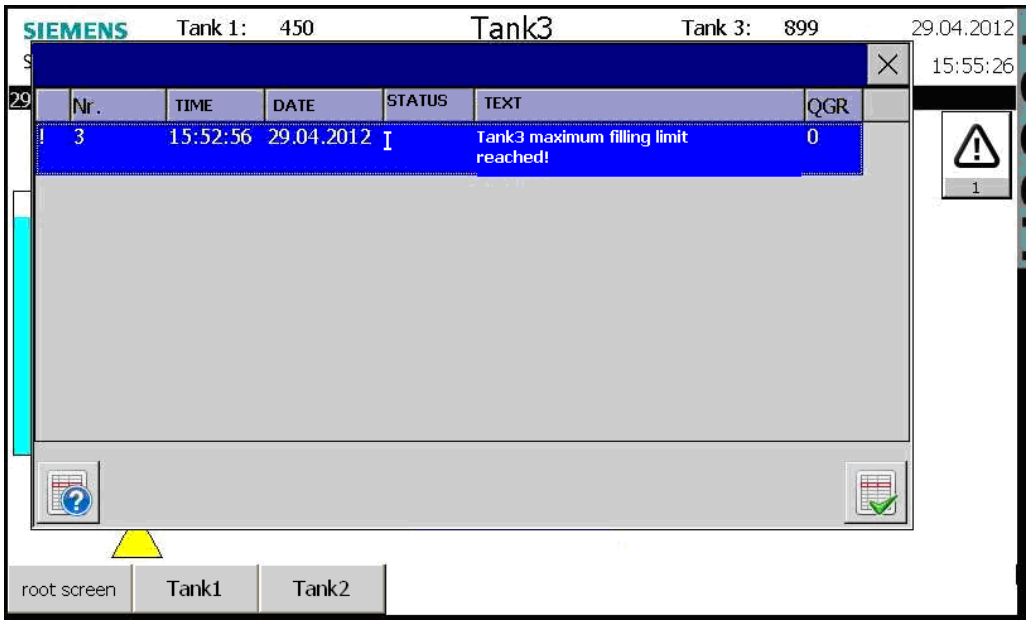
11.3 Testing alarm configuration in Runtime

Open the supply valve of Tank 3 and let the fill level rise to above the maximum value.

The alarm indicator appears and the alarm text appears in the alarm line.



Open the alarm window by clicking the alarm indicator.



The alarm indicator remains until the alarms are gone (i.e., the causes have been eliminated) and have been acknowledged, even if you close the alarm window or switch to a different screen.

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12. Configuring recipes

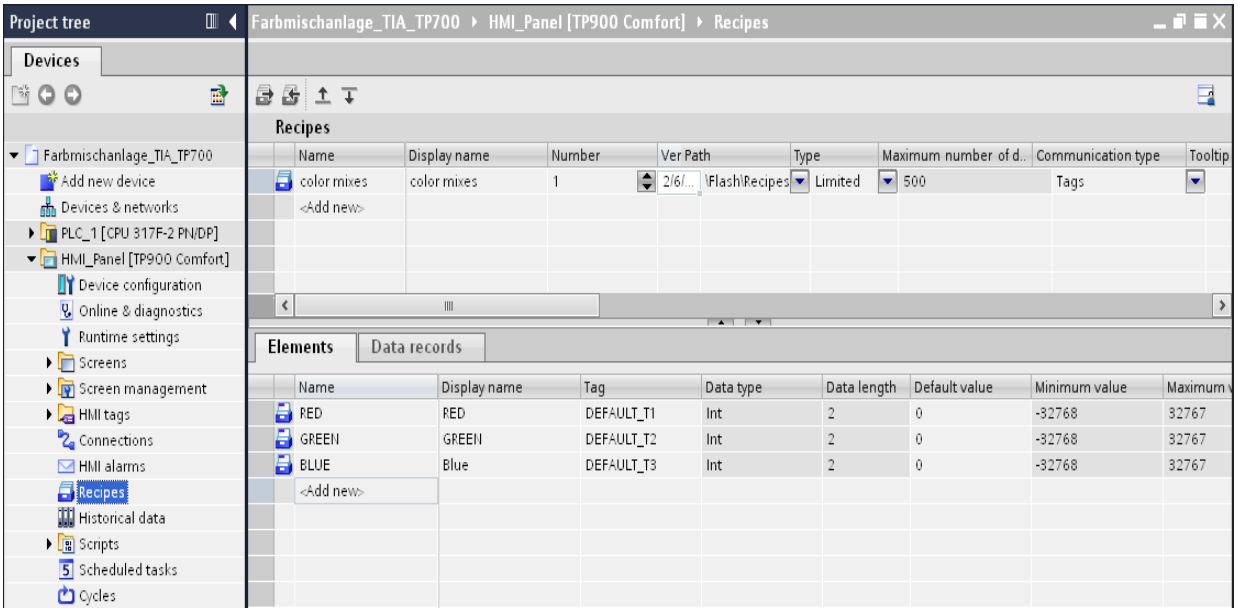
Recipes can be created for the various mixing ratios of the color mixing station. Recipes can be used to transfer several tags to the controller at the same time. Recipes can be stored in the controller or in the panel.

12.1 Adding recipes

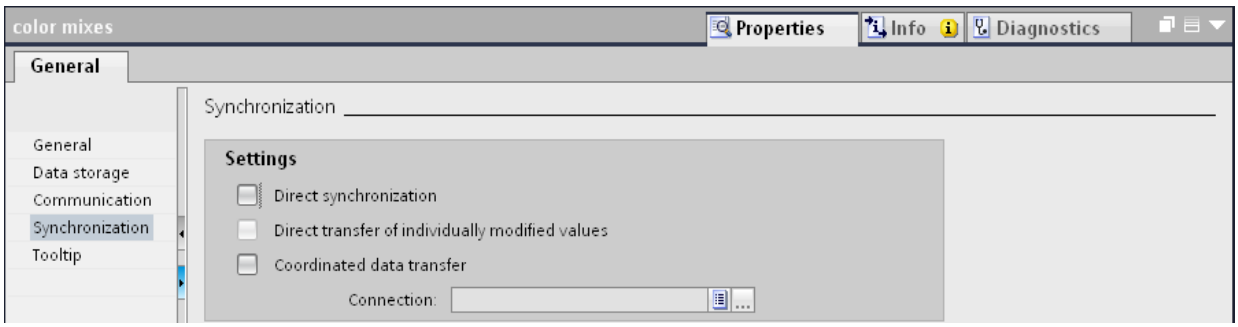
Double-click "**Add recipe**" in the project window.

Enter "**color mixes**" as recipe name and as display name.

Create three recipe elements with the names "**RED, GREEN, BLUE**" and connect these with the tags for the default setting of Tank 1 to Tank 3.


Project tree
Farbmischanlage_TIA_TP700 ▸ HMI_Panel [TP900 Comfort] ▸ Recipes
Devices
Recipes
Farbmischanlage_TIA_TP700
Add new device
Devices & networks
PLC_1 [CPU 317F-2 PN/DP]
HMI_Panel [TP900 Comfort]
Device configuration
Online & diagnostics
Runtime settings
Screens
Screen management
HMI tags
Connections
HMI alarms
Recipes
Historical data
Scripts
Scheduled tasks
Cycles
Name | Display name | Number | Ver Path | Type | Maximum number of d.. | Communication type | Tooltip
color mixes | color mixes | 1 | 2/6/... \Flash\Recipes | Limited | 500 | Tags
<Add new>
Elements | Data records
Name | Display name | Tag | Data type | Data length | Default value | Minimum value | Maximum
RED | RED | DEFAULT_T1 | Int | 2 | 0 | -32768 | 32767
GREEN | GREEN | DEFAULT_T2 | Int | 2 | 0 | -32768 | 32767
BLUE | Blue | DEFAULT_T3 | Int | 2 | 0 | -32768 | 32767
<Add new>

Remove the check mark for "**Synchronization**" in the properties of the recipe.



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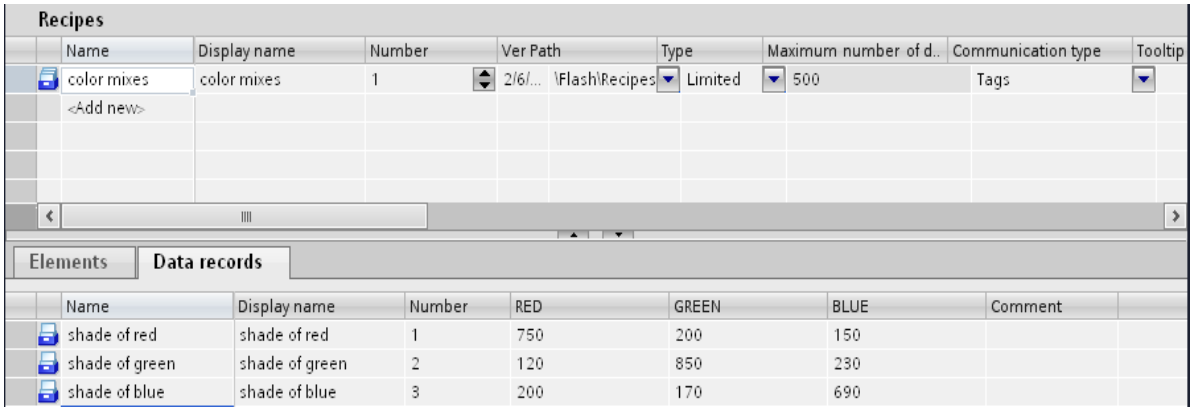
12.2 Specifying data records

Click "**Data records**" and enter the data records of the "**color mixes**" recipe.



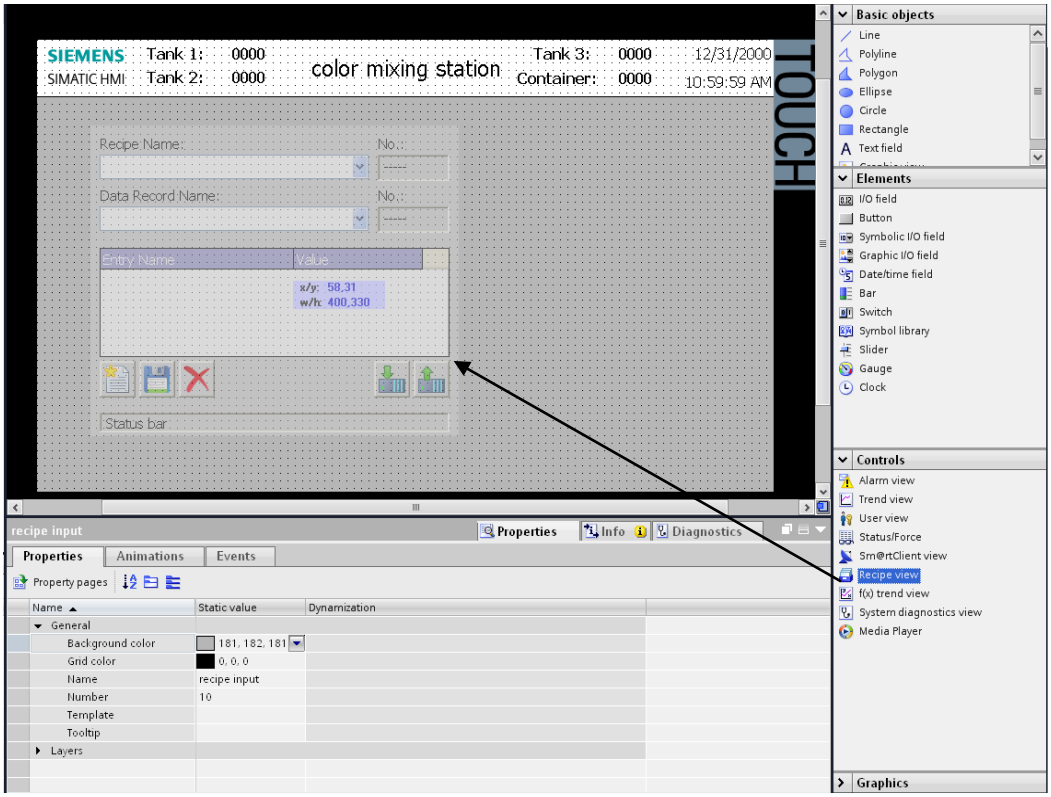
12.3 Creating "Recipe input" and "Select recipe" screens

Two additional screens have to be created in order to enter and select recipes. A recipe view with freely definable buttons can thus be used to input new recipes or to make a selection.

Configuring the "Recipe input" screen

Create a new screen with the name "Recipe input".

Drag a **Recipe view** from the Tools window under **Controls** to the screen.



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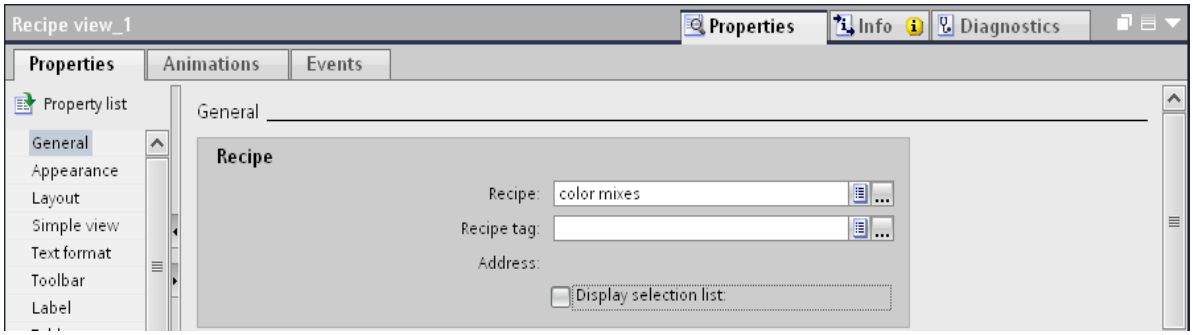
Select the recipe "**color mixes**".

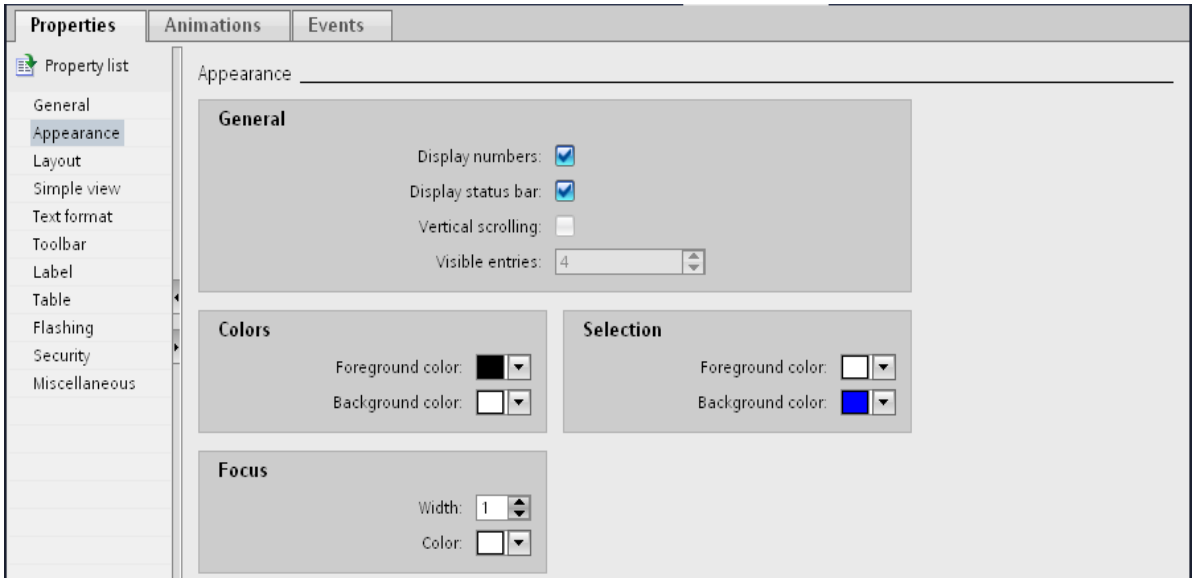
Remove the check mark for **Display selection list**.

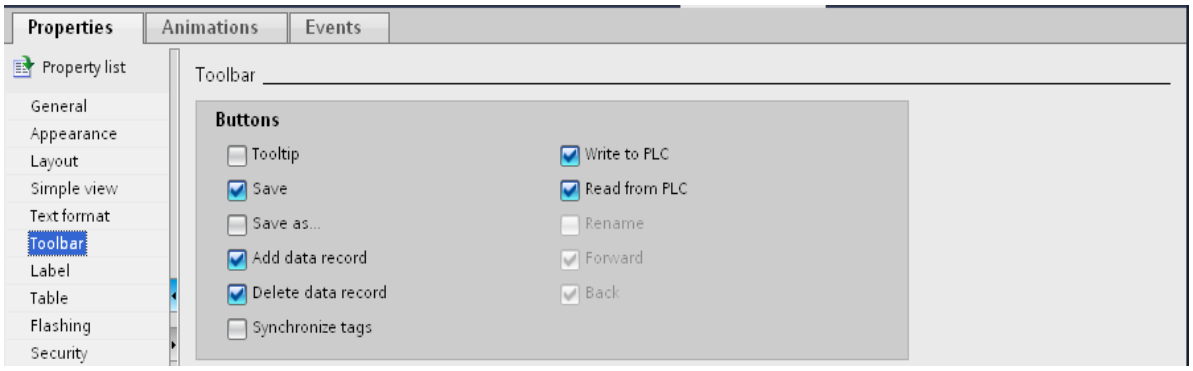


Set the background color to white.

Change the position to **X0** and **Y0** and the size to **800 x 350**.

The appearance and button settings can be applied.





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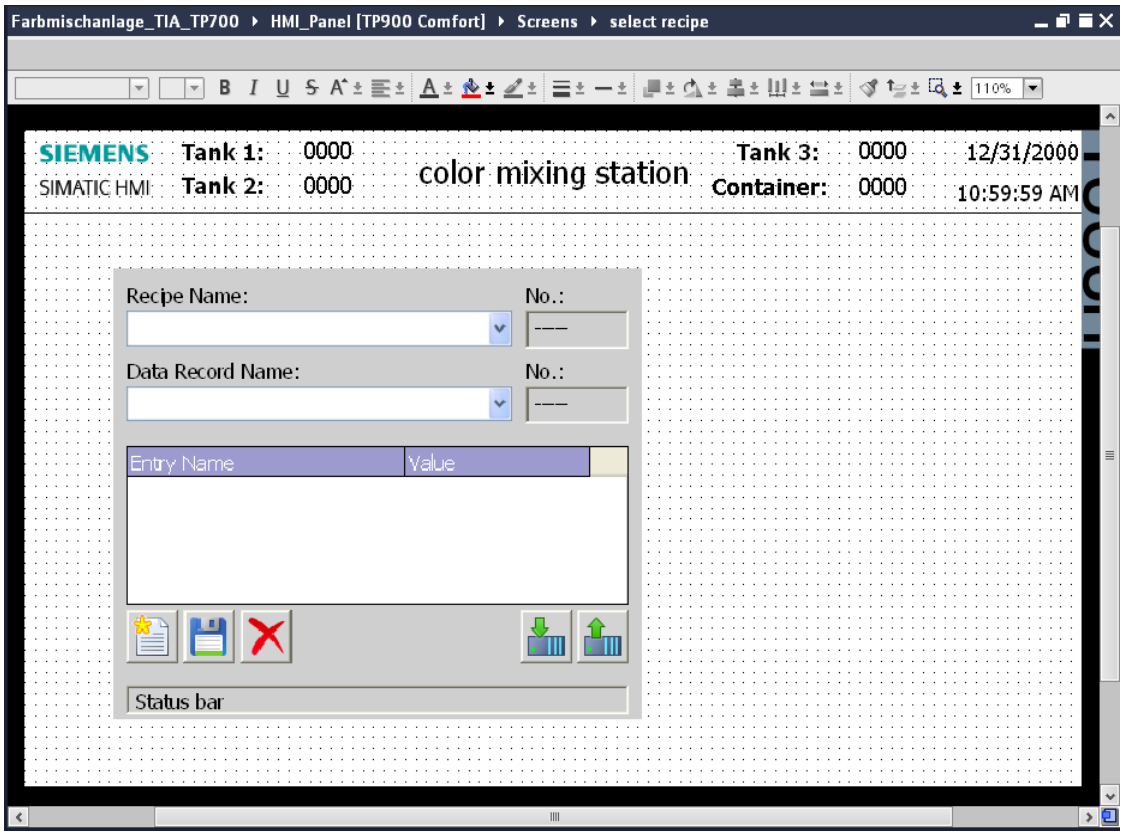
Configuring the "Select recipe" screen

Create a new screen with the name "Select recipe". Drag a **Recipe view** from the Tools window under **Controls** to the screen.



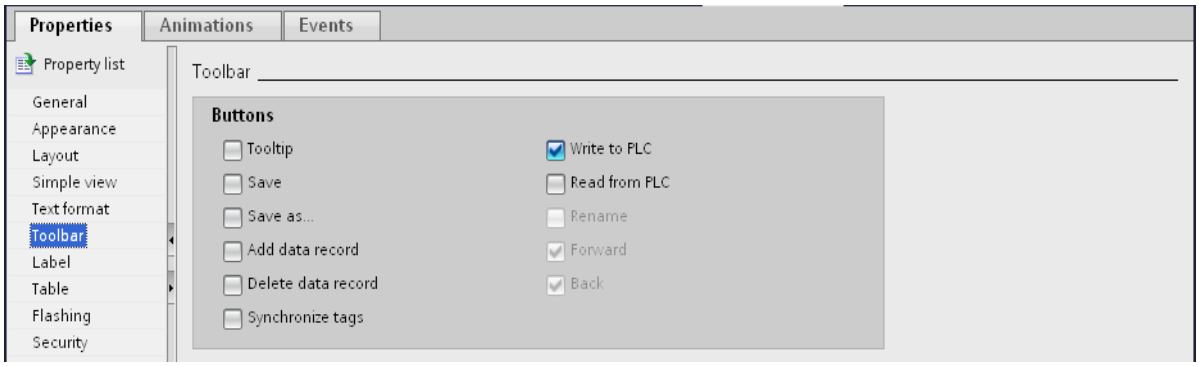
Select the recipe "**color mixes**".

Remove the check mark for **Display selection list** and for **Editing mode**.

Set the background color to **white**.

Change the position to **X0** and **Y0** and the size to **800 x 350**.

Remove all buttons except "**Write to PLC**" in the recipe view.



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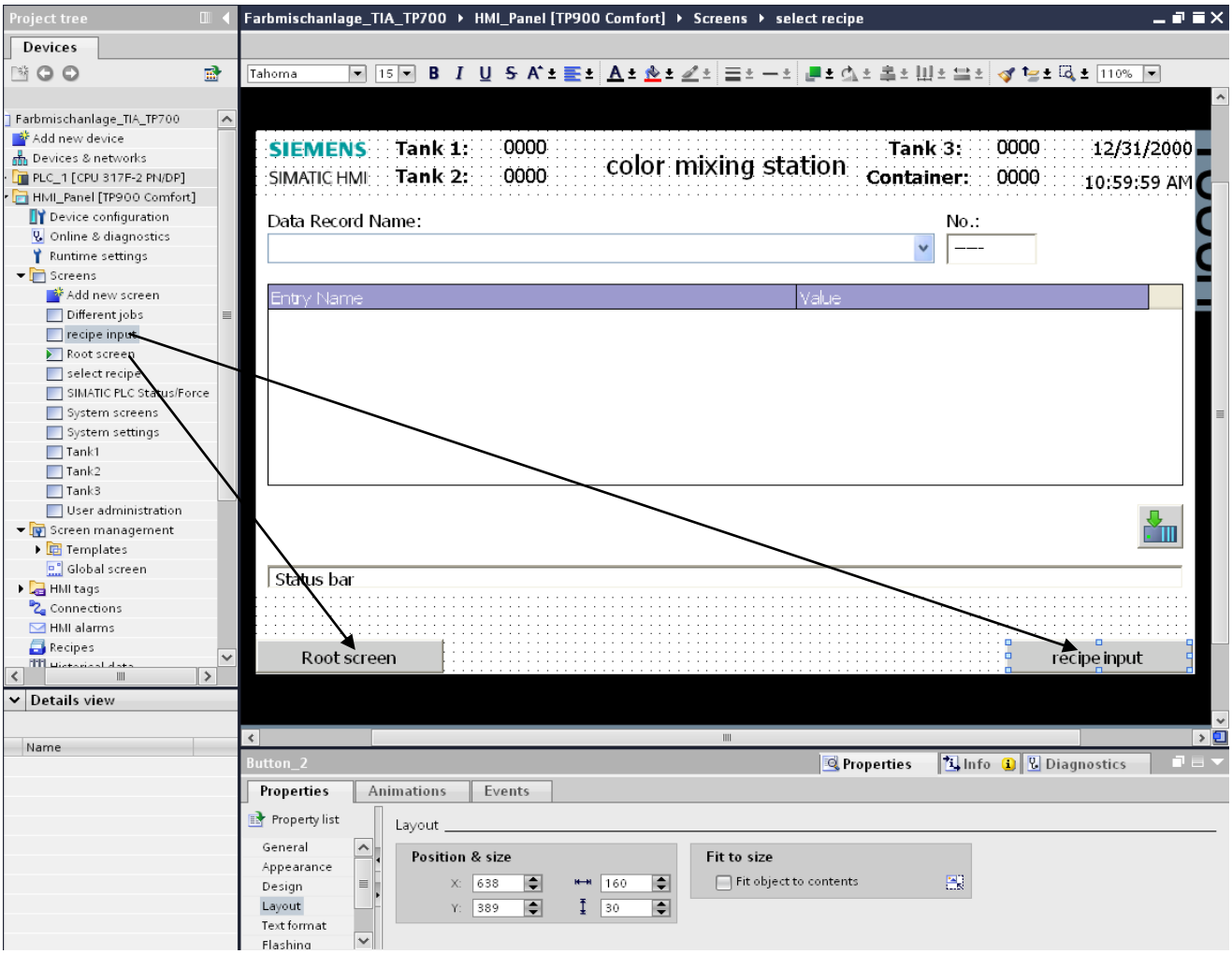
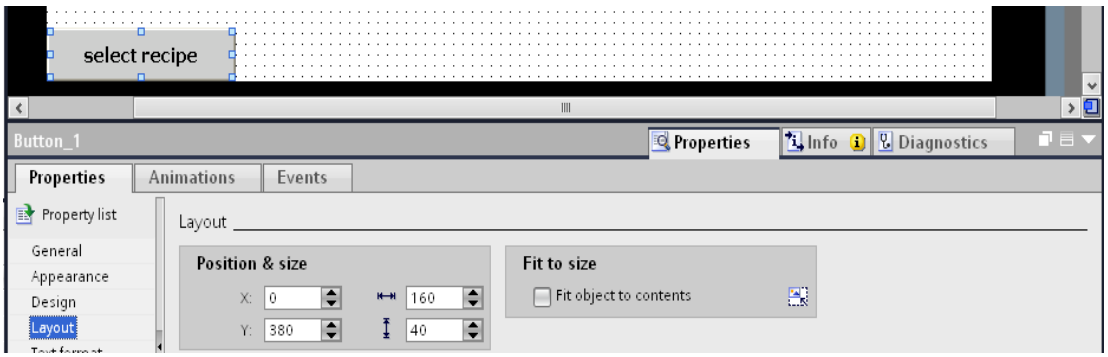
Configuring buttons for screen change

Drag the **root screen** and the "**Recipe input**" screen to the "Select recipe" screen.

Change the position and size of the buttons.



Create the buttons in the "Recipe input" screen in exactly the same way.



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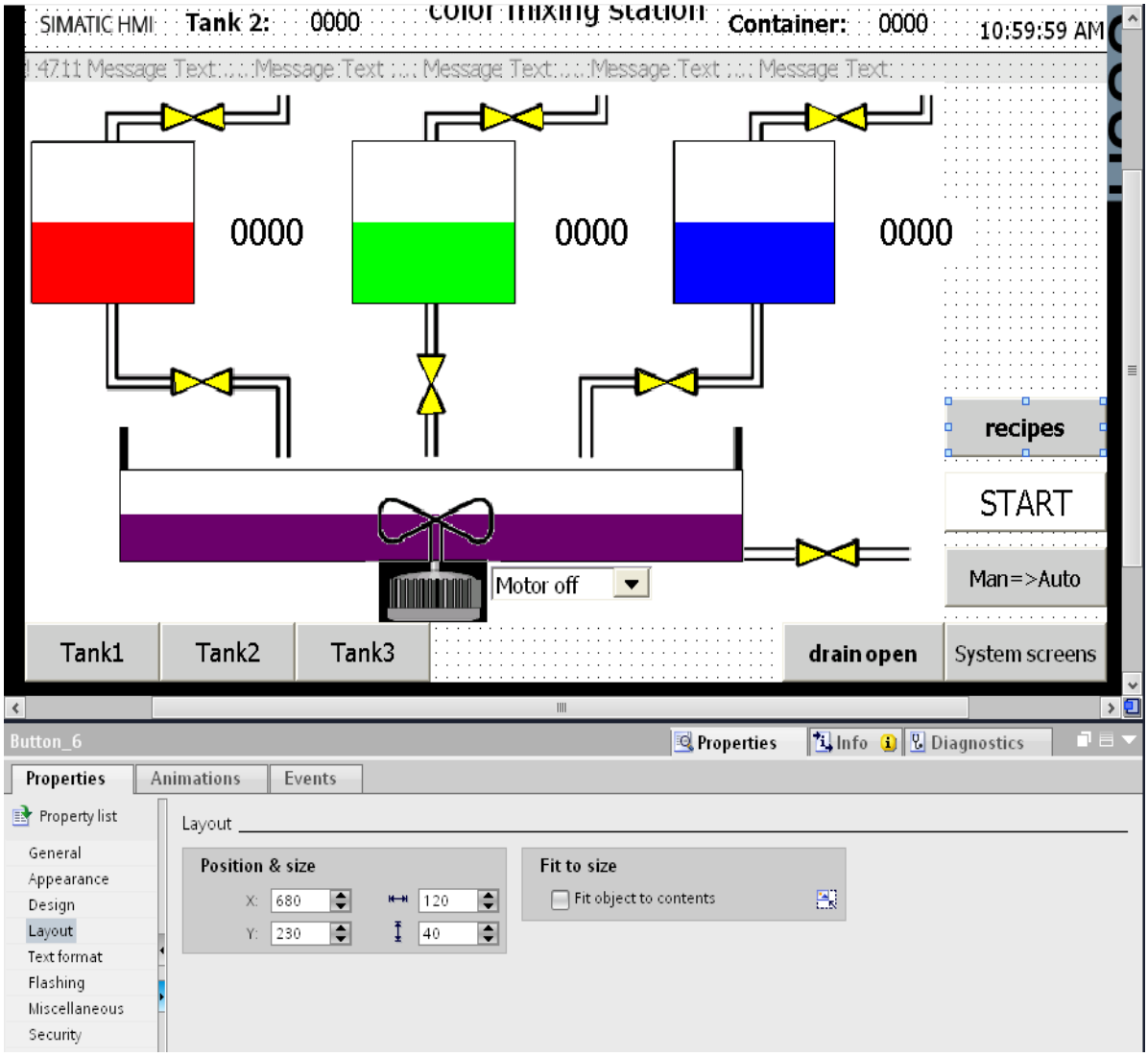
Go to the root screen.

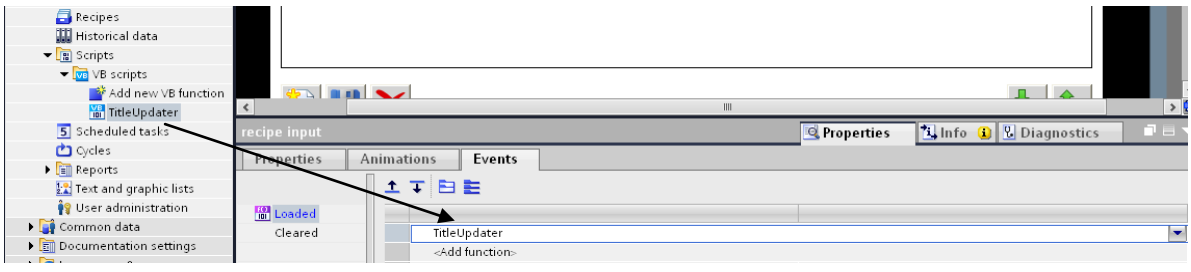
Drag the "**Select recipe**" screen to the root screen.

Under General, change Text OFF to "**Recipes**".

Change the position and size of the button.



To display the screen name properly, you have to drag the VB script "**TitleUpdater**" as event for the **Loaded** screen to the newly created screens.



Save and load the project.

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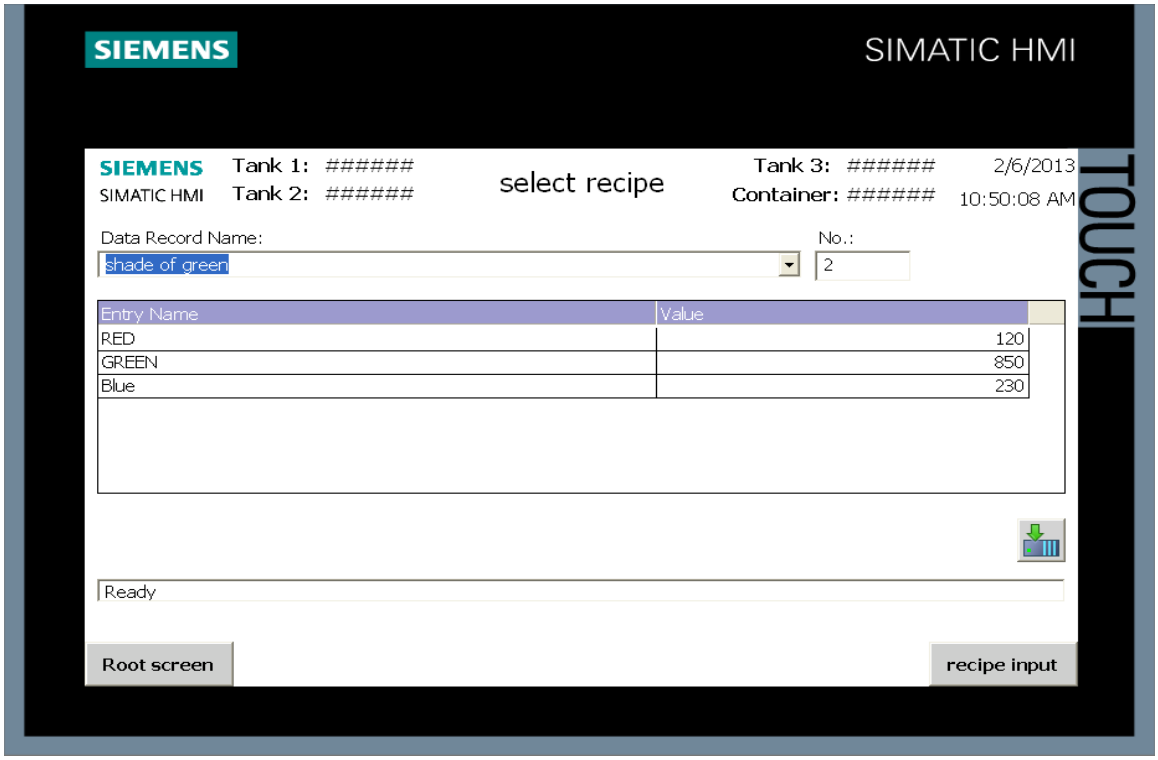
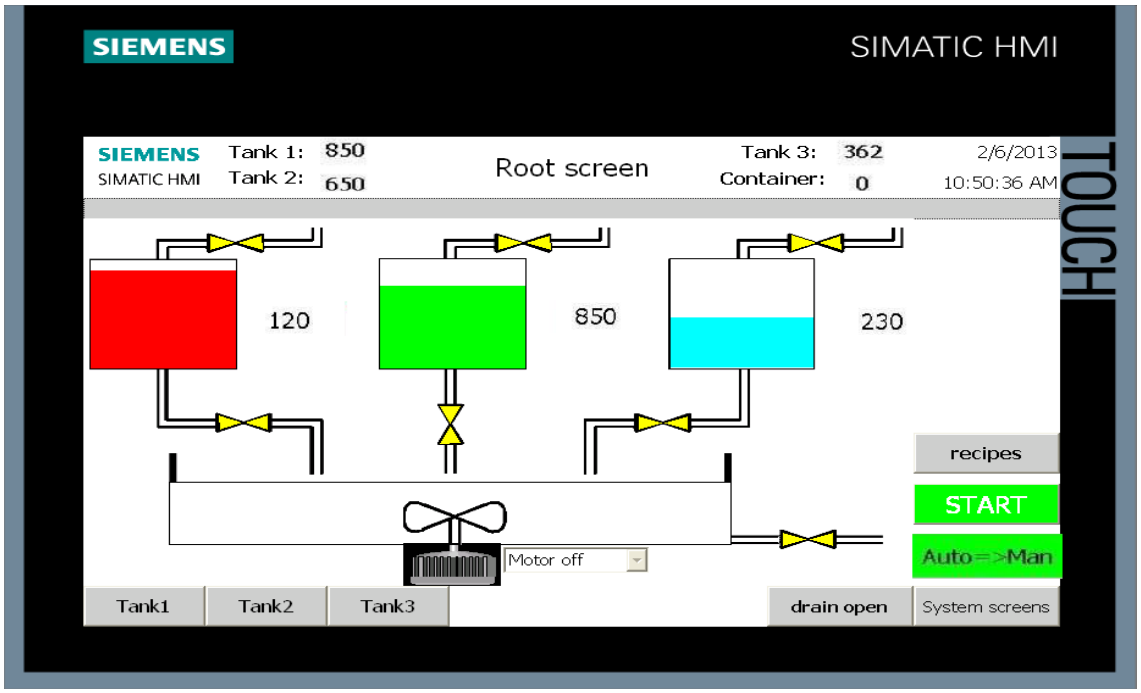
12.4 Selecting a recipe in Runtime

Go to the "Select recipe" screen and select a data record; the values are then written to the recipe tags.

The default values are loaded to the CPU by the "**Write to PLC**" button.





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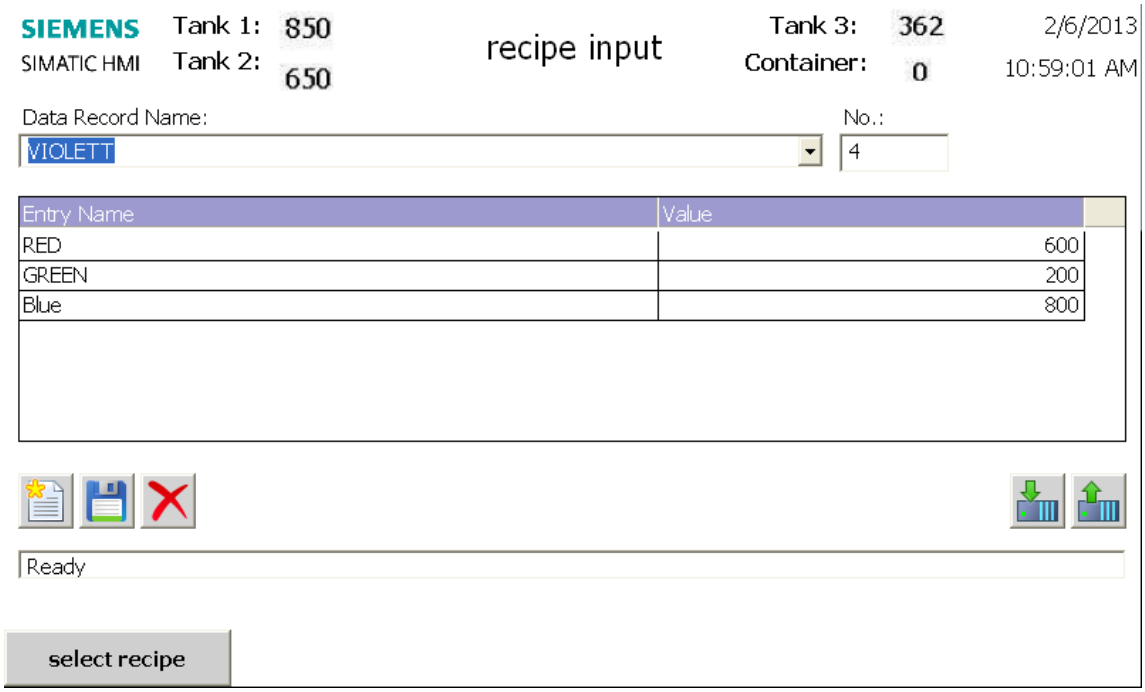
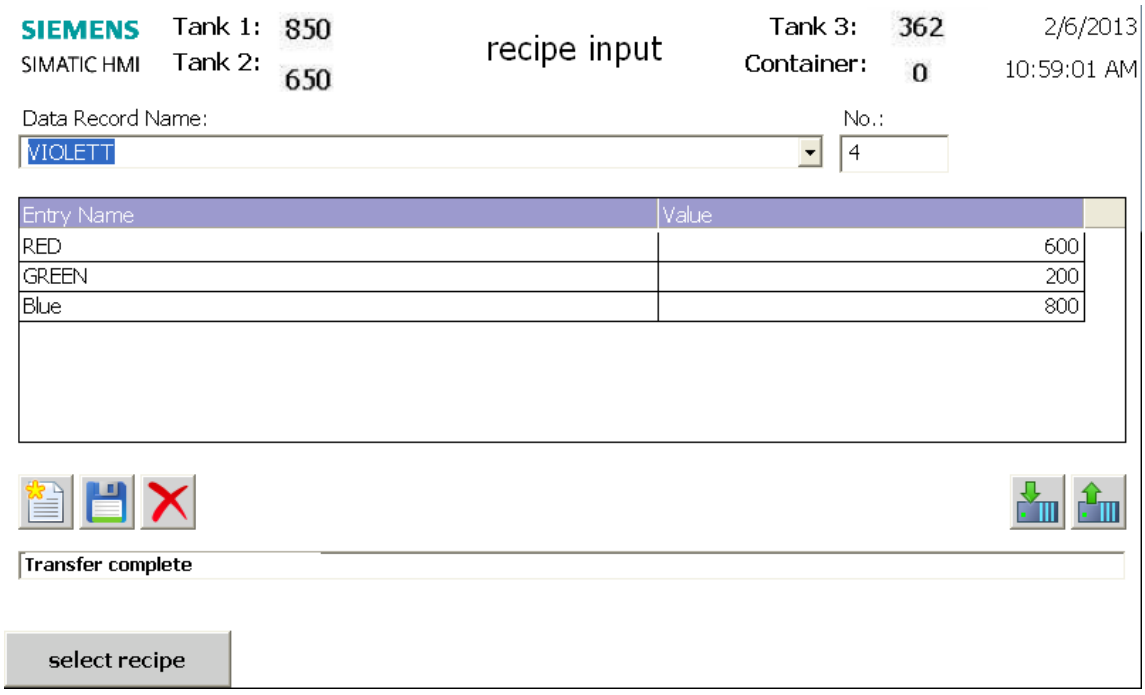
12.5 Entering new recipes in Runtime

Go to the "Recipe input" screen and click the "**New**" button.

Enter the data record name and the values.

Click the button to save and select the data record in the selection screen.





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13. Configuring user administration

The user administration is used to set up user groups and users.

The access rights are granted to a user group. These access rights control the access to data and functions to protect them against unauthorized operation.

A user is then assigned to a user group.

13.1 Setting up user groups

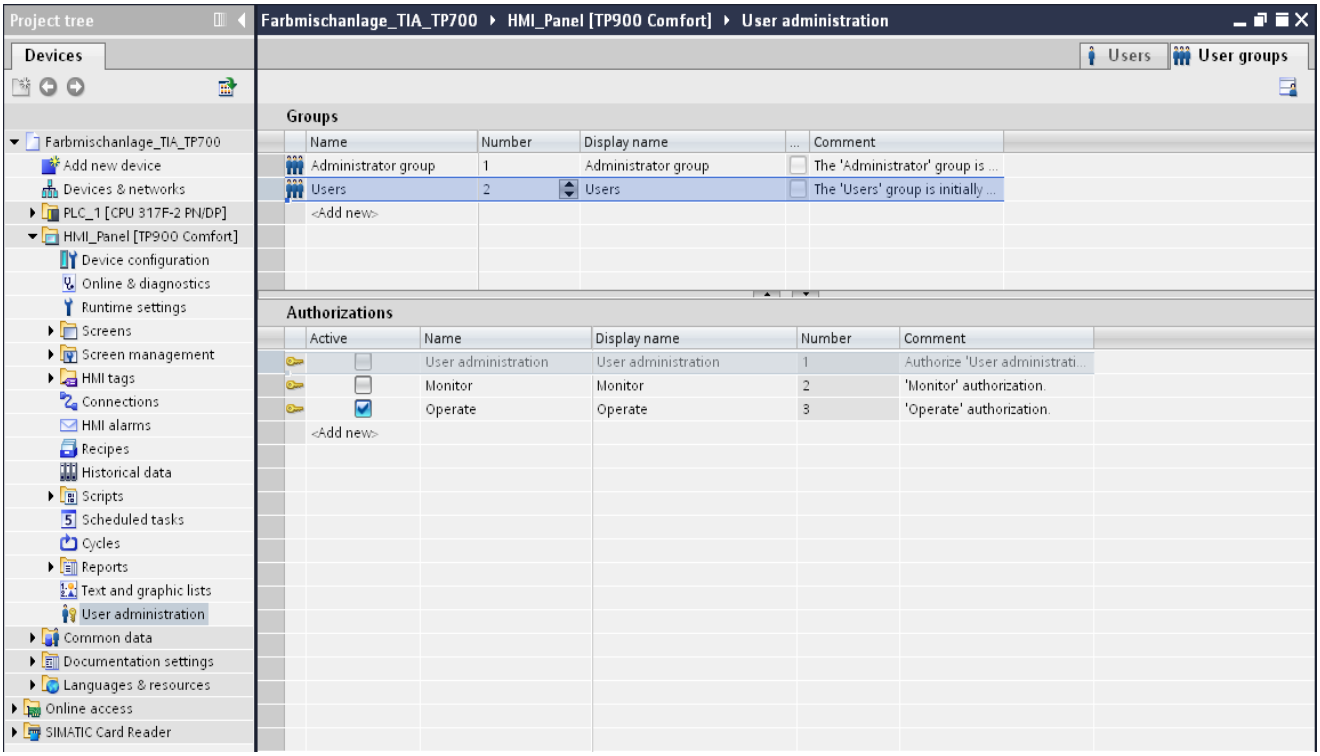
Double-click **User administration** in the project window.

Select the **User groups** tab.

Two user groups are already created by default: the administrators group with all rights and the users group with the right to operate.

However, additional authorizations can also be assigned to users.

For our color mixing station, we need two more user groups with additional authorizations.



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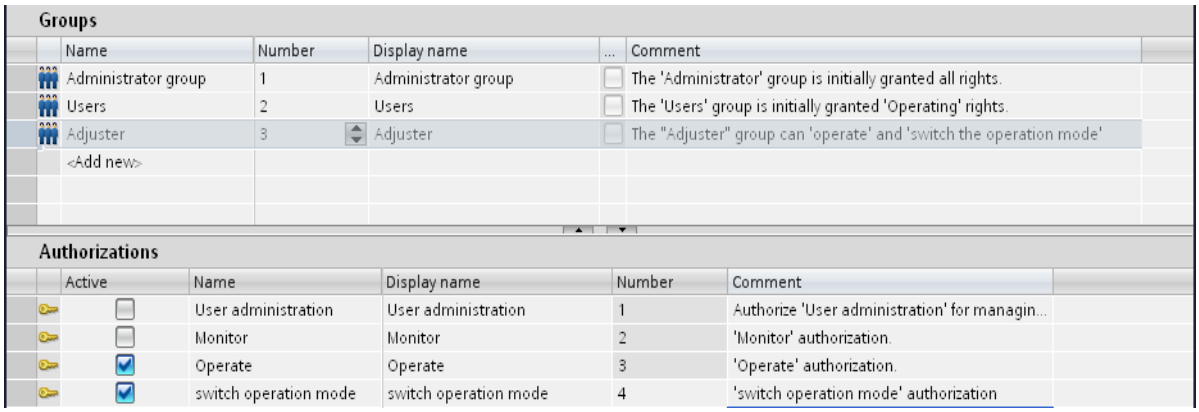
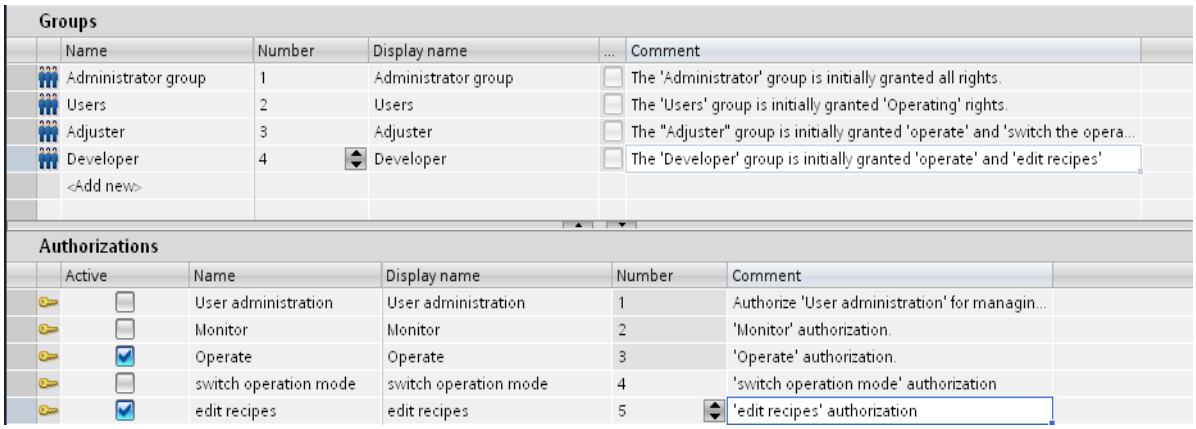
Create the group "**Adjuster**" with the authorization "**switch operation mode**".


Groups
Name | Number | Display name | ... | Comment
Administrator group | 1 | Administrator group | The 'Administrator' group is initially granted all rights.
Users | 2 | Users | The 'Users' group is initially granted 'Operating' rights.
Adjuster | 3 | Adjuster | The "Adjuster" group can 'operate' and 'switch the operation mode'
<Add new>
Authorizations
Active | Name | Display name | Number | Comment
User administration | User administration | 1 | Authorize 'User administration' for managin...
Monitor | Monitor | 2 | 'Monitor' authorization.
Operate | Operate | 3 | 'Operate' authorization.
switch operation mode | switch operation mode | 4 | 'switch operation mode' authorization

Create the group "**Developer**" with the authorization "**edit recipes**".

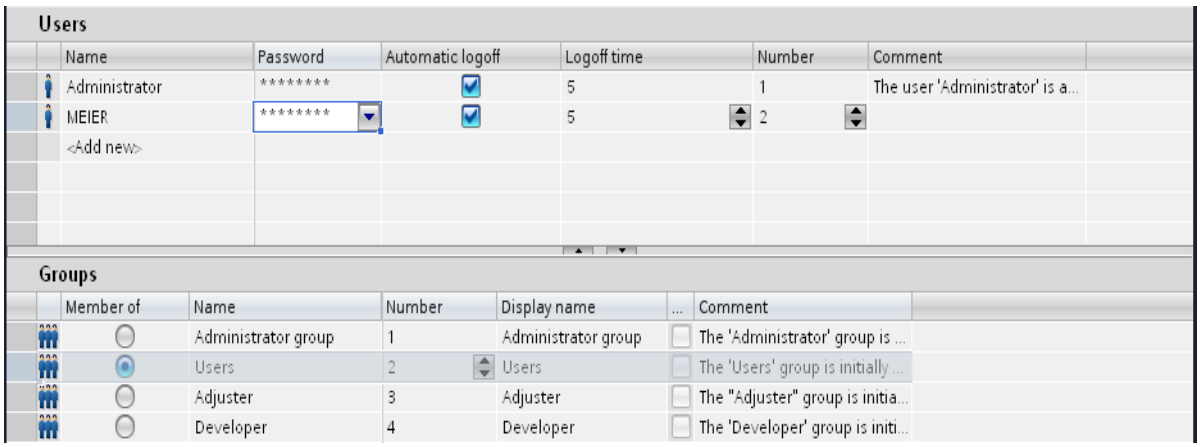

Groups
Name | Number | Display name | ... | Comment
Administrator group | 1 | Administrator group | The 'Administrator' group is initially granted all rights.
Users | 2 | Users | The 'Users' group is initially granted 'Operating' rights.
Adjuster | 3 | Adjuster | The "Adjuster" group is initially granted 'operate' and 'switch the opera...
Developer | 4 | Developer | The 'Developer' group is initially granted 'operate' and 'edit recipes'
<Add new>
Authorizations
Active | Name | Display name | Number | Comment
User administration | User administration | 1 | Authorize 'User administration' for managin...
Monitor | Monitor | 2 | 'Monitor' authorization.
Operate | Operate | 3 | 'Operate' authorization.
switch operation mode | switch operation mode | 4 | 'switch operation mode' authorization
edit recipes | edit recipes | 5 | 'edit recipes' authorization

13.2 Creating users

Select the **Users** tab.

We will create three new users here and assign these to user groups.

Create a **user** with the name "**MEIER**" and the password "**HANS**".


Users
Name | Password | Automatic logoff | Logoff time | Number | Comment
Administrator | ******** | 5 | 1 | The user 'Administrator' is a...
MEIER | ******** | 5 | 2
<Add new>
Groups
Member of | Name | Number | Display name | ... | Comment
Administrator group | 1 | Administrator group | The 'Administrator' group is ...
Users | 2 | Users | The 'Users' group is initially ...
Adjuster | 3 | Adjuster | The "Adjuster" group is initia...
Developer | 4 | Developer | The 'Developer' group is initi...

Note

Note that these entries are case-sensitive.

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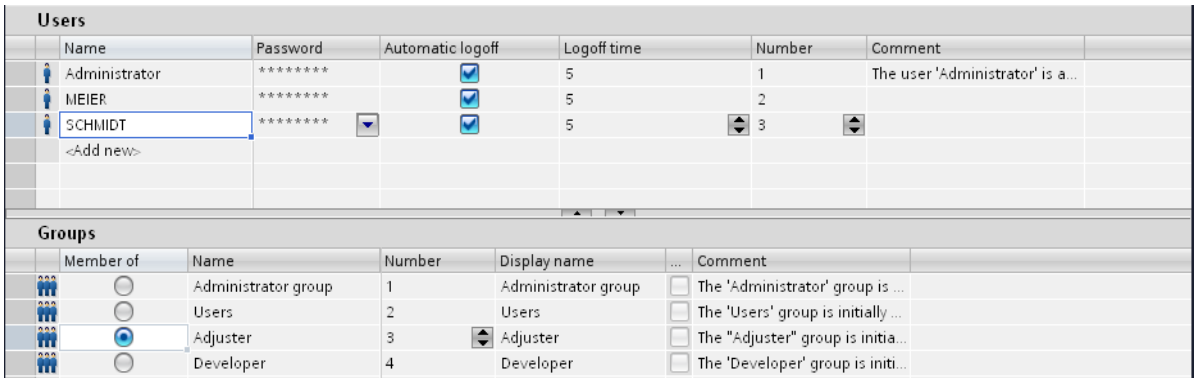
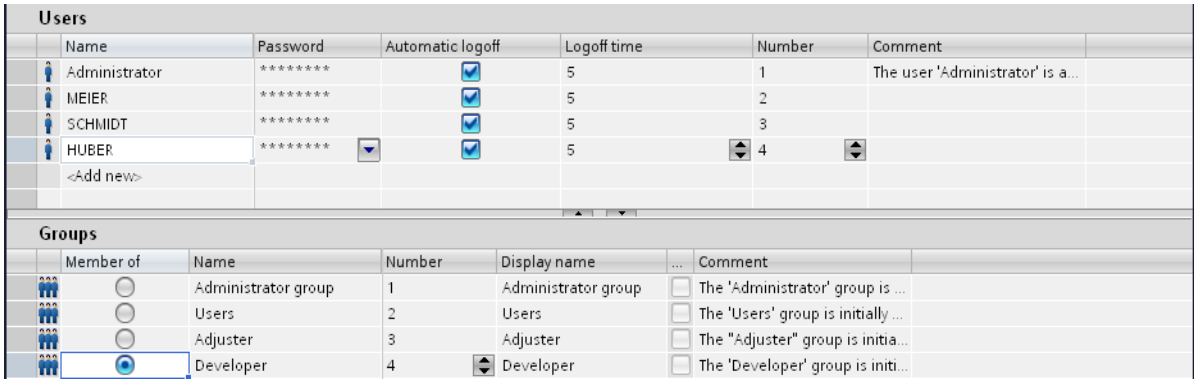
Create an **adjuster** with the name "**SCHMIDT**" and the password "**KLAUS**".



Create a **developer** with the name "**HUBER**" and the password "**FRANZ**".



13.3 Assigning authorizations

Only users with operator control authorization are permitted to operate the start button and select a color mixture from the recipes.

Only adjusters are authorized to switch the operating mode to manual operation of the plant.

Only developers are permitted to change or enter new recipe data records.

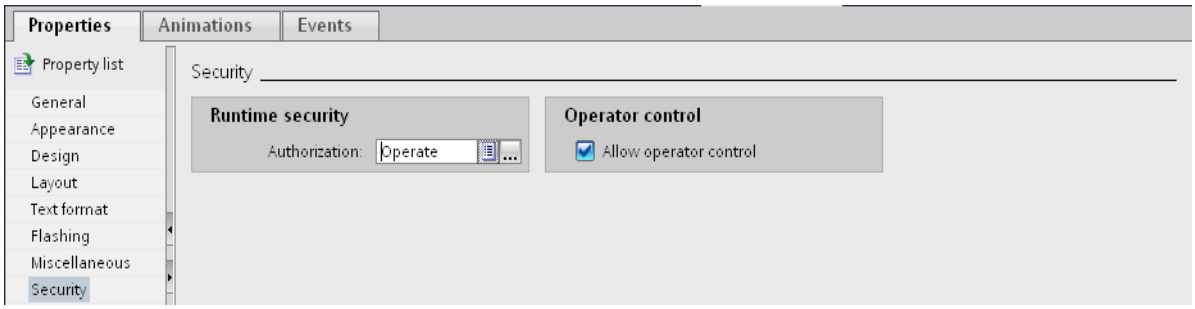
No access protection is required for all other functions, such as screen changes.

Start button security

Open the root screen and select the "**START**" button.

Under Security, select the "**Operator control**" authorization.

Set the check mark for **Allow operator control**.



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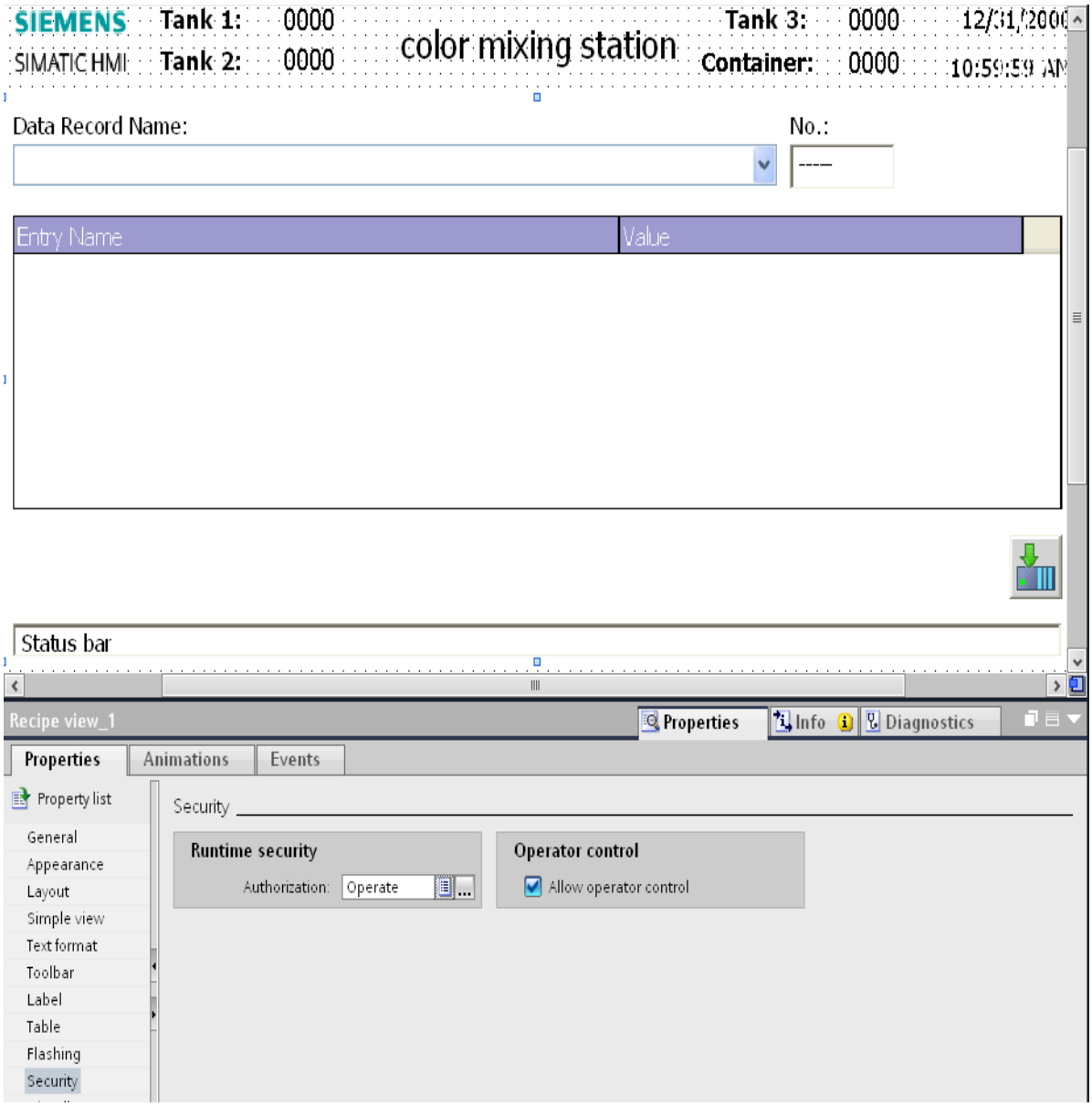
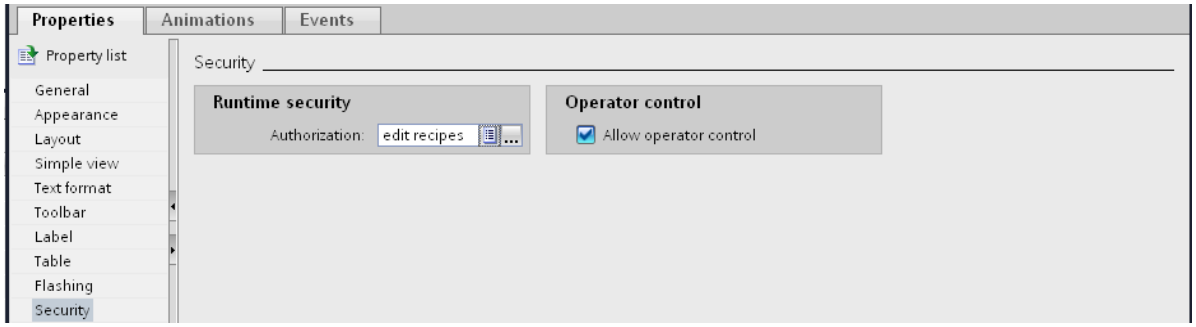
Security of data record selection

In the “**Select recipe**” screen, select the recipe view and change the security settings.



Security in recipe input

Change the authorization of the recipe view in the “**Recipe input**” screen to **edit recipes**.



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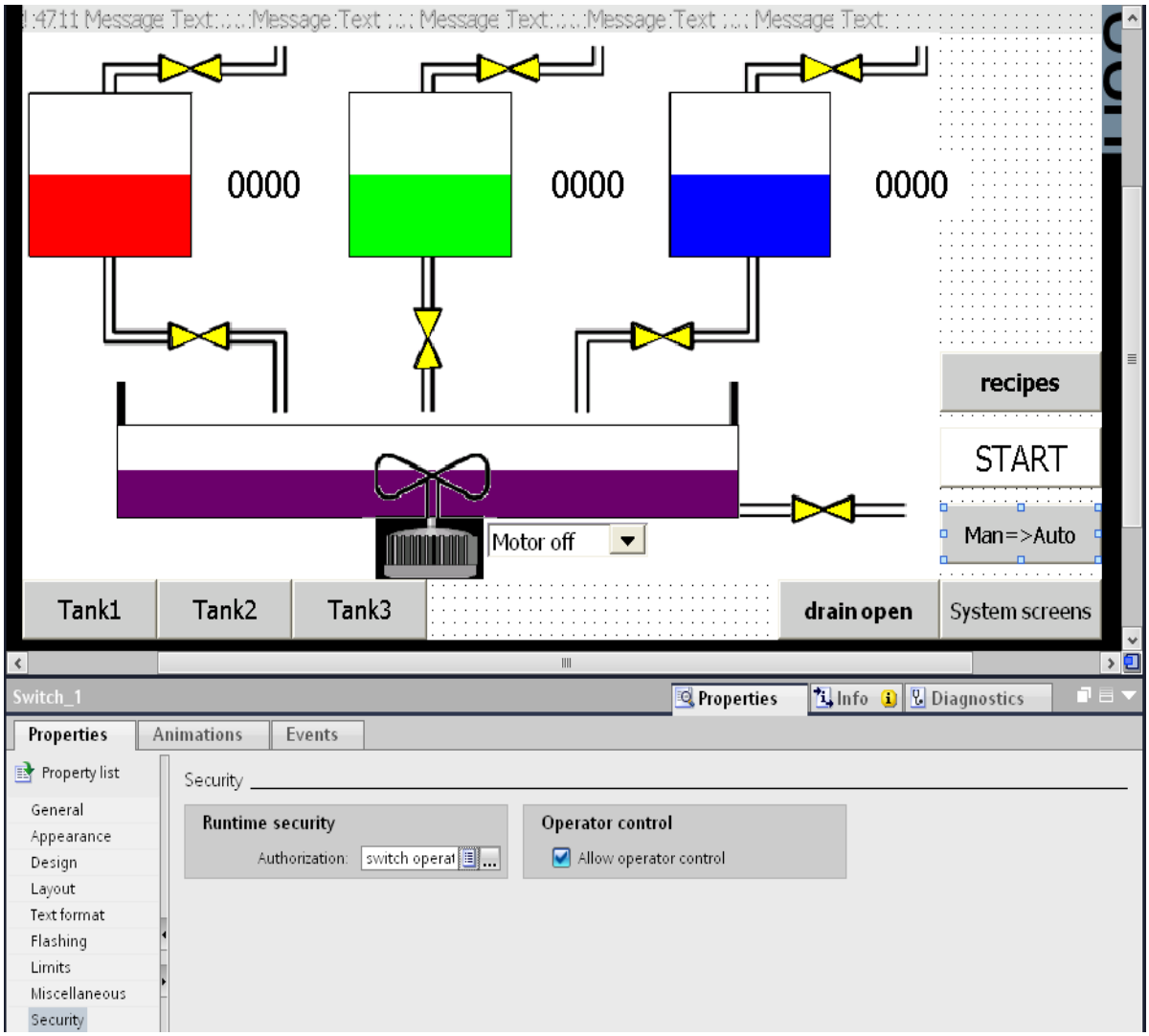
Security in operating mode selection

Change the security settings for switching between automatic and manual mode to authorization **switch operation mode**.



Save and load the project.

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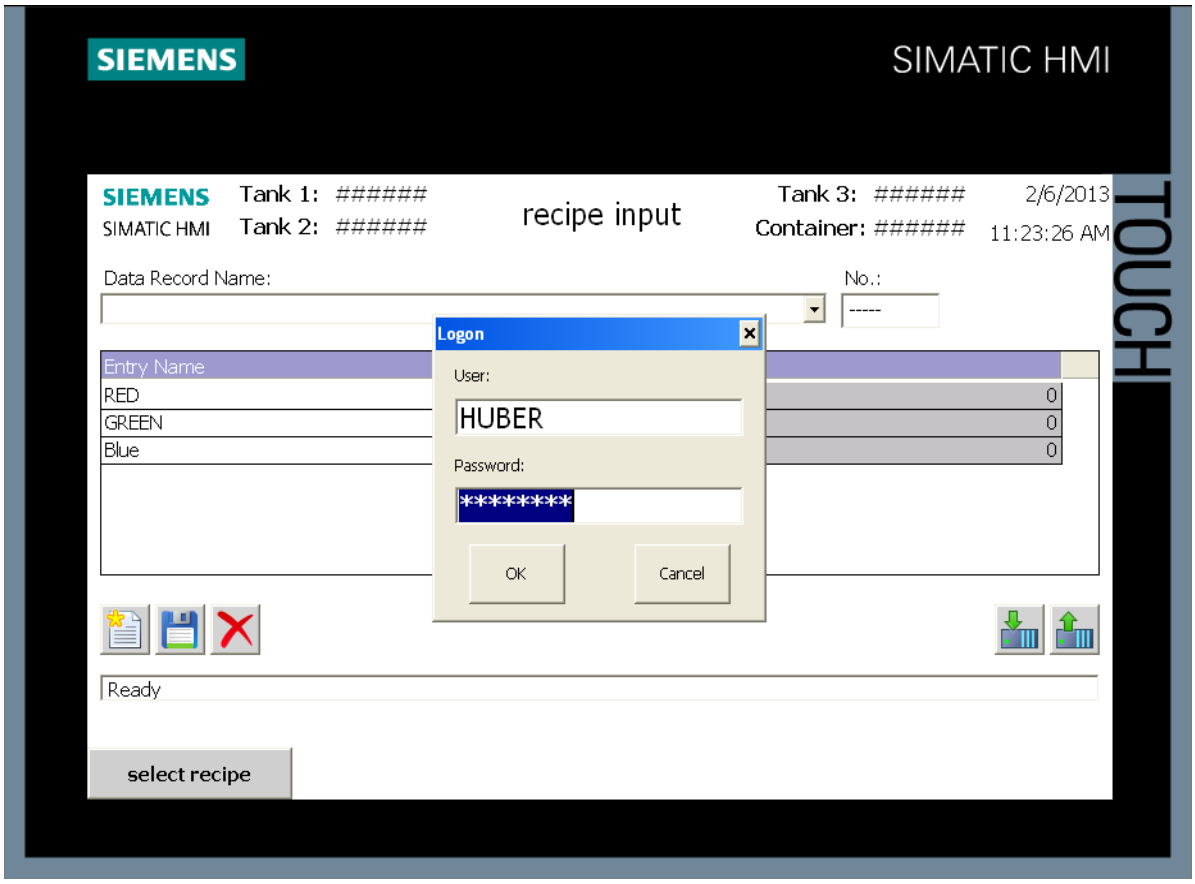
13.4 Testing user administration in Runtime

If you operate a protected object in Runtime, a logon window will prompt you to enter a user name and password. After these have been entered, the object must be operated again.



Test the security settings of the buttons in Runtime.

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